EFFECTIVE UNIVERSITY LEADERSHIP - ATTRIBUTES, BEHAVIOURS, CHALLENGES AND DEVELOPMENT: KEY PREDICTORS OF PERFORMANCE

by

Martin Robert Crees-Morris

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Declaration of Originality

This thesis contains no material which has been accepted for a degree or diploma by the University or any other institution, except by way of background information and duly acknowledged in the thesis, and to the best of my knowledge and belief no material previously published or written by another person except where due acknowledgement is made in the text of the thesis, nor does the thesis contain any material that infringes copyright.

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The research investigations conducted for this thesis abide by the ethical requirements of the University of Tasmania Human Research Ethics Committee. Ethics approval was gained through applications H0015432.

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Abstract

For many decades now, Australian universities have been confronted with ever increasing pressure to improve their relevance and undertake organisational transformation. As economies engage in increasingly competitive global markets, disruptive innovations and digital technologies forever transform business models and the way we work. Governments and society expect the education sector to both equip students and demonstrate how we meet these challenges. Nowhere is this more apparent than in the higher education sector where universities are increasingly not only expected to become part of the mechanisms through which advancing learning and knowledge transfer is intrinsically tied to sustainable competitive advantage of nations but are also seen as a critical sector contributing to a nation's economic performance. Nevertheless, for all this purported importance very little research seems to have been done on the capacity of senior leaders in universities to achieve success in a constantly changing environment while confronting challenges that attack the nature and purpose of the institution. Moreover, there is little critical research into the development of university leadership models particularly when compared to the corporate sector.

This thesis provides: (a) a summary of the evolution of leadership theory, (b) a review of research into university leadership (c) a leadership model for universities, derived from education sector-based research and then (d) identification and validation a set of leadership capabilities to further develop the university leadership model. The findings of this thesis are an important step forward in the development of the leadership model and show that the proposed capabilities are considered important for university leaders as well as indicating key areas for leadership training and development.

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Chapter 1 Introduction

Senior leadership is the root cause of success or failure in all universities

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Langford (2013) postulates that leadership among senior managers is what predefines success or failure. This observation is made after conducting over forty commissioned surveys of universities in Australia and New Zealand. Many of the greatest leadership experts such as a Warren Bennis, Peter Drucker and John Kotter have worked as academics, but they all found their most receptive audiences outside universities. This is unexpected. Given the clear link between the quality of higher education and national GDP (OECD), it would be reasonable to anticipate that university leadership would be an area of vital interest not only to universities but to state and national governments. This, however, is not the case; university leadership is very sparsely researched (Scott, Coates, & Anderson, 2008) and is continuing to attract criticism (Hall, 2017). There are various models for reforming university leadership presented in (Dempster, 2009; Townsend & MacBeath, 2011) and the external pressure to identify the leadership capabilities for universities is growing (Ghasemy, Hussin, & Daud, 2016).

1.1 Research Gaps and Research Questions

The moderate amount of research into university leadership has focused on vice chancellors, deans and heads of department (Bolden et al., 2012) with the research attempting to understand the links between the individuals and the university performance (Goodall, 2009) and with a strong emphasis on academic credibility of the individual (Bolden et al., 2012).

What the research has yet to fully consider is a whole of organisation approach to leadership at all levels based on a coherent understanding of the capabilities of university leadership guided by a leadership model rather than the piecemeal approaches to date.

It has already been established that the topic of university leadership lacks research and the findings of the literature review only discovered two published pieces of research which dealt directly with the topic of university leadership capabilities viz:

Education (Scott et al., 2008)

Academic leadership capability framework: a comparison of its compatibility and applicability in Australia, New Zealand, and Malaysia (Ghasemy et al., 2016)

However there does not appear to be any momentum generated by this research. Furthermore, the actual work on the identification of organisation specific capabilities is being carried out in the private sector. This work is regarded as commercial in confidence as a cornerstone of capability driven strategies (Tallman & Fladmoe-Lindquist, 2002).

The second gap identified was the lack of development of a leadership model for universities. Again, the literature search failed to identify a relevant model.
Based on the above discussion, this thesis will address the following question: *What leadership capabilities are required for effective leadership in universities?* This question will be addressed through a series of subsidiary questions:

1) *What does the literature reveal about the current state of development of leadership theory?*

2) *What is the current understanding of university leadership?*

3) Is there a set of leadership capabilities which might be adapted to higher education?

4) What does higher education staff survey data reveal about the proposed capabilities?

1.2 Universities – History and Current Challenges

The rapid pace of global change has raised fundamental questions about the role and identity of universities. There exists a general perception that universities have not significantly changed their focus in more than 800 years (Anderson, 2012), that is to say their leadership, management and strategic focus persistently reflect their ecclesiastical origins and an ideological rather than a practical focus (Bolden, 2012).

The modern university has its roots with the formation of the University of Bologna around 1088 (Rüegg, 2003) from the well-established cathedral schools (Oestreich, 1913), although its antecedents in India and the Islamic world may also lay claim to this title. A key feature of the University of Bologna is that it functioned independently of kings, emperors and religious organisations (Makdisi, 1981). Unlike the southern European universities which were run by the students, Bologna was a *"self-regulating, independent corporation of scholars" (Pryds, 2000)*, a critical evolution in the role of the academics as leaders in universities.

The “corporation of scholars” structure, influenced by the medieval monastic processes in schools of theology (O'Mullane, 2011, p. 64), led to a collegiate decision-making model being regarded as the traditional form of leadership particularly in the older research universities (McNay, 1995) (Rasdall, 1966, p. 199). This form of leadership is seen as the inverse of a normal hierarchical pyramid and is a structure in which the academic members themselves are the leadership system (O'Mullane, 2011, p. 63).

The OECD work on learning innovation (OECD, 2013) identifies three strands of learning innovation – “Learning Research”, “Innovative Cases”, and “Implementation and Change”. These strands reflect the belief that a critical starting point to consider innovative change in the organisation of learning is

the close understanding of learning itself. These three strands show how research can inspire practice (Mayer, 2010) and how learning evolves in specific practitioner environments through the communication of case studies (Peña-López, 2013).

These strands of learning have formed a substantial foundation on which to consider change strategies, initiatives and approaches for "Implementation and Change", the on-going third strand and demonstrate how scholars constantly seek to understand and improve learning and teaching as a primary focus at a school level however this does not translate to a leadership focus in universities. The breadth of activities in a university and the global environment mean that throughout history, the changes faced by leaders of universities has been driven from two sources – those driven by external change and those driven by internal change - as scholarship and the need to understand education and learning evolved.

a) Universities driven by external change

Universities have continued in much of their original form in spite of major societal changes such as the industrial revolution (Bolden, 2012). However, Nietzsche in *Twilight of the Idols* (1889) feels compelled to comment about the efforts of German universities to 'manufacture' more science teachers to support national and commercial interests. "*For seventeen years I have not tired of shedding light on the de-spiritualizing influence of our contemporary science business" (Nietzsche, 1889).* Furthermore, other commentators (Jackson, 1990) noted that the first industrial revolution saw the rise of the technical institutes and the education of sections of society which would not have access to university education. This supports Nietzsche, but also presages the 'massification' of university education with its impact on the leadership debate. The collegiate model, referred to above is coupled with another closely held academic right - that of academic freedom (Altbach, 2001; Tourish, 2011) and the external pressures of the last four decades have seen, what academics have felt to be, a direct attack on both academic rights and university autonomy (Berdahl, 1990). This ties directly back to issue of academic identity, a point made by Bolden (2012) and many others that universities can be seen as organisations with an unresolved dual identity issue and the concomitant tension between values- and performance-based expectations.

Whilst the world outside universities has undergone considerable change, universities themselves remain curiously reluctant to change what they see as a successful educational model (Boxall, 2015), despite clear signals that change is needed (Bowles, 2005, 2016) and the proposal of forward looking operating models (Ernst, 2011; Rohan, 2012) (Halloran, 2018). These forces come from the evolution of the knowledge economy in the fourth industrial revolution and the case for expanding higher education from an elite cadre of students to an argument for education for all students based on the notions of social justice (Taylor, Henry, Lingard, & Rizvi, 1997) and the recognition of the link between educational levels and a country's GDP (OECD, 2012; Valero, 2016). However, in spite of the inevitability of the continuing change, the response to the external environment by university

leadership remains mixed and the need to focus on leadership competencies is a work in progress (O'Mullane, 2011, p. 142).

b) Universities driven by internal change

The increase in the rate of external change has focused attention on developing a greater understanding on the brain; the mindsets needed to be effective in turbulent environments and on how we learn. Neuroplasticity has attracted considerable attention (Doidge, 2007) as it has indicated that the brain has far more adaptive ability than previously thought. Neuroplasticity has been defined as "*the brain's ability to change, remodel and reorganize for purpose of better ability to adapt to new situations"* (Demarin & Morović, 2014). The theme of constant change has seen the development of the concept of adaptive leadership which has its origins in the work of Heifetz (1994) and has seen the emergence of commentary on mindsets (Dweck, 2008), leadership mindsets in particular (Kalikow, 2014) and mindfulness as means of achieving such mindsets (Hunter & Chaskalson, 2013).

There has also been a considerable body of work developing and challenging the traditional teaching and learning mindsets. McBeath (OECD, 2013, p. 100) has developed a children's university as a means of changing parents and children's mindsets about higher education. Bowles has been focusing research on the future needs of the workforce through the identification and development of capabilities (Bowles, 2016) and this work has found direct expression in the course offerings of Deakin University (Oliver, 2016) amongst others.

Hamel (2009) asked the question "*How in the age of rapid change do you create organizations that are as adaptable and resilient as they are focused and efficient?"* and subsequent work on agility (McKinsey, 2017) recognised the two types of thinking required to succeed – stable and dynamic. This dualism also finds support in Kahneman's book *'Thinking Fast and Slow*' (Kahneman & Egan, 2011) Kahneman describes the two ways ('fast' and 'slow') in which we habitually think. We need to identify our cognitive biases, but we also have to understand that we need to be disciplined adaptive thinkers when required – a message which applies equally to education as it does to leadership and leadership development.

Furthermore, the structure and focus of Western style universities continues to be on a disciplined-based education which remains unchanged since the formation of western universities rather than the responsive, student-centered approaches required in the digital age (Bowen & Lack, 2013). What response there has been, is characterized by a constant failure to instigate change effectively is reflected in the often-piecemeal initiatives, disconnected from a coherent view of the role of higher education, which leaves staff cynical and organizations worse off (Birnbaum, 2000). The broader

literature provides ample evidence for the fact that effective change does not just happen but must be led (Kotter, 2012).

1.3 University Leadership

As already stated senior leadership has been identified as the root cause of success or failure in universities (Jacobson & Johnson, 2011; Langford, 2013) and therefore demands critical evaluation and systematic understanding and development (Bryman, 2007). As Burns (1978, p. 2) indicates 'leadership is one of the most observed and least understood phenomena on earth'. This is no less so in the university sector in Australia. The literature suggests that universities pay insufficient attention to the identification and development of leadership skills (Spendlove, 2007) and do not generally evaluate leadership beyond the internal individual performance review (Burgoyne, 2009). University leadership, in particular, has been identified as an under researched area (Scott et al., 2008).

The success or failure of university leadership is further obscured when placed into the context of continuous, disruptive change. Highly skilled and experienced leaders can often fail an organisation which is challenged by transformations that upset traditional thinking, processes and operating models (McCann & Selsky, 2012). Research indicates the critical importance of leaders is nowhere more evident than in the ability of an organisation to engage with people and to remain engaged with the changing needs of staff and customers, adapting operations and workforce capability to market demands, and maintaining strategic relationships when faced with environmental turbulence (Bowles, 2014; Kaplan & Norton, 2001; McCann & Selsky, 2012). Universities are not immune from the increased turbulence impacting their operating environment. The increased significance of institutional leaders in a university leading change and maintaining organisational identity (Bolden, 2012) and the translation of purpose into staff engagement and strategic response to disruptive change remain nascent in the university sector (Mukerjee, 2014).

The Leadership for Learning (L4L) (Dempster, 2009) model has been identified as one of the few, if not the only, potentially relevant leadership models developed through global research that specifically applies to education institutions. This model was developed for schools and one of the objectives of this thesis is to consider its application to universities.

This thesis will test the proposition that the leadership framework from the L4L literature may be a basis for a potential model for university leadership. The elements of the L4L framework will be examined in the light of current data available from research into universities to determine the extent to which the L4L factors are acknowledged and measured. The next step will be to identify and confirm through the means of a survey, drawing on research from industry, those elements of a leadership model which would apply to university leaders. This will allow for the development of

university leadership model which can be further refined through larger survey and through comparison against the leadership models being developed in industry.

1.4 Leadership Capability in Higher Education

This section introduces the dynamic capability of agility into the 'static' concepts of leadership and organisation. This extends the leadership model to not only recognise the complex organisational identity of an organisation but also allow the organisation to anticipate and respond to turbulence in ways which strengthen the entity. Leadership, identity, action and agility all start at the individual level which suggests that systems, networks, development and feedback must begin and end with the consideration of the individual.

Organizational Agility: A remedy for university leadership in a world of rapid change?

Organisational agility is a concept which some commentators such as (Kidd, 2000, p. 8) assert first emerged in an Iacocca Institute report *"21st Century Manufacturing Enterprise Strategy"* in 1991 (Goldman, Nagel, & Preiss, 1995). This was in a US national response to competitive threat to their manufacturing industry and therefore the early work was on agile manufacturing and supply chain e.g. (Rigby, Day, Forrester, & Burnett, 2000) and (Kisperska-Moron & Swierczek, 2009). Kidd observes the how of agility was only broadly defined but the why was always clear in terms of the objectives. He supplies an example which illustrates this: *"Agility is dynamic, context specific, aggressively change embracing, and growth oriented. It is not about improving efficiency, cutting costs, or battening down the business hatches to ride out fearsome competitive storms. It is about succeeding and about winning profits, market share and customers in the very centre of competitive storms that many companies now fear*."(Goldman, 1998).

As the field evolved the definitions became more generally applicable such as organisational agility can be defined as *"an organisational dynamic capability to achieve renewable competitive advantage through continuous adaptation in a turbulent environmen*t". (Casler, 2012). This definition implies that agility is an inbuilt capability which is constantly scanning the internal and external environments, and which has effective mechanisms for constant assessment, communication, feedback, decision making and action. The 'why' of agility became more sophisticated as it embraced knowledge management (Bowles, 2005, p. 125) and strategic boundary management (McCann & Selsky, 2012, p. 50). However the focus of agility remains the individual and the capability development of the individual (Bowles, 2005, p. 125).

Without attempting a definition (Sherehiy, Karwowski, & Layer, 2007) identify the primary attributes of agility as "speed, flexibility, and effective response' which leads to the consideration of the underlying components of what is required for an organisation to be agile e.g. change capability. This underlies the Casler definition above which extends the discussion of agility into models and frameworks in order to address the 'how' of agility mentioned by Kidd (Kidd, 2000). Casler (ibid) also

introduces the concept that agility has to be aligned with other organisational capabilities and attributes in order for it to be effective i.e. an integrated whole of organisation capability

If a university is defined as being a dual identity organisation – both normative through its academic activities and bureaucratic through its business activities; then this may have implications for the understanding of turbulence on a university. As McCann and Selsky (McCann & Selsky, 2012, p. 9) point out it is the individual who really bears the impact of turbulence. This carries the implication that the impact of turbulence and the agility capability may also have a dual nature. The literature focuses on the responses from the business perspective (Gumport, 1999). However whilst the warnings about the impact of performance managing academics have been sounded (Tourish, 2012) this remains an unresolved issue. The question remains of whether the identity of a university will benefit from a better understanding of agility in response to change. Current research offers some insights to a university namely:

1. Strong agility underpins the ability to survive despite turbulence. (Lengnick-Hall & Beck, 2009, p. 16).
2. Agility is strongly correlated with resilience and competitive advantage (McCann, Selsky, & Lee, 2009).
3. The level of turbulence determines the type of response and the type of outcome (Lengnick-Hall & Beck, 2009, p. 18) or it could adopt an adaptive design approach (McCann & Selsky, 2012, p. 22).
4. An organization requires foundation capabilities in place to underpin any response to change. McCann identifies these as being purposeful, aware, action-orientated, resourceful and networked. (McCann & Selsky, 2012, p. 13). Whilst Lengnick-Hall (2009, p. 20) identified key capabilities as (a) a unified managerial commitment, (b) strategic acuity enabling key leaders to identify and appreciate opportunities and threats, (c) fluid and tinkerable (sic) resources that can be mobilized, reassembled, and redeployed to meet differing needs, and (d) adept learning, unlearning and knowledge exploitation capabilities.

So, whilst research shows that increasing turbulence, a strong relationship between agility and competitive advantage and identifies the internal capabilities required to respond, there are no insights into how universities themselves have adopted their own research into agility.

That universities have been faced with constant change is well documented (Moore, 2000) and that universities have been forced to anticipate and respond to market vagaries is also acknowledged (Slaughter & Leslie, 2003). That this change has become potentially disruptive for Australian universities due to the 2014 budget is also acknowledged (Margison, 2014). This, along with the fact that universities tended to respond as business organisations, would lead to the reasonable

conclusion that there is nothing to exclude modern universities from having to respond to turbulence and therefore to adopt agile capabilities. The ability of an organisation to respond effectively to turbulence is dependent on its organisational structure. Sherehiy's observation (2007) that organic design is a more appropriate structure for unstable and continuously changing environments poses a challenge for organisations which tend towards a bureaucratic mindset. Sherehiy also makes the observation that "*The different conditions and elements in organization's environment create a pressure for internal differentiation"* and that *"Internal differentiation allows different parts of organization to specialize in responding to different demands of the environment."* (Sherehiy et al., 2007). Comments which could be applied not only to the academic/administrative elements in a university, but it also leads to the proposition that different faculties operate under different conditions of change. Therefore, a model of university capability could have each faculty taking responsibility for its own agile response whilst operating in a co-operative agile framework for the whole organisation as an organic and effective way of handling change.

Universities have faced change for many years and on many fronts (Moore, 2000):

- Increased competition
- Conflicting demands from stakeholders
- Changing demographics
- Limited funds
- Technology

Looking at such forces commentators (Rohan, 2012, p. 12) predicted that over the next 10-15 years change would or should make universities:

1) Adopt leaner business models,
2) Adopt corporate business models with academic overtones,
3) Whilst private providers will exploit niche sectors, and
4) Policy makers will seek to maintain higher enrolments whilst cutting or restricting funding.

Such changes have arrived earlier than expected with the 2014 Australian federal budget. Thus, the pressures create many institutional tensions such as those between quality and survival, research and teaching, social obligation and pragmatism, and rankings and cash flow. Rohan (p. 4) continues with an outline of what he considers to be the three likely dominant business models:

1) Streamlined status quo
2) Niche dominators
3) Transformers – new entrants.

The question has to be asked of how many universities have embraced these changes and taken steps to anticipate any major change. As McCann (2009) points out (and lays the blame) "*A dangerously flawed lapse in institutional leadership is manifest in the inability or unwillingness to*

proactively and creatively manage situations when tensions are clearly building" (McCann et al., 2009) which has arguably been the case for universities for the last twenty years. Therefore, change may place pressure on universities and their leaders by threatening their structures and the finances which support them; however, as McCann observes they have a choice not to either anticipate or to react. Indeed, as unpublished university consolidated survey data (Crees-Morris, 2015) has shown inaction around and dismissal of staff survey results certainly appeared to be the case for the university whose survey data indicated leadership lapses which went from bad to chronic over a period of four years. It would be valuable to survey universities on their attitude to agility as this would indicate a willingness to respond to actual or potential pressure.

1.5 Leadership capabilities

Leadership capabilities are those behaviours, attributes and traits which can be considered essential to the recruitment and development of staff in an organisation. This section will connect the concept of leadership, effective leadership, leadership development through organisational performance to organisational agility. A definition of academic leader as someone in a position to identify the need to change, to monitor and motivate during the change and finally deliver change within higher education, at the institutional level and departmental/college level (Anthony & Antony, 2017). which deals with the human aspect of leadership. Boedker (2011, p. 16) reasonably extend this definition and points out that leadership is important to an organisation's performance through choice of management systems and through their influence on employees. This is 'the right leadership needs to do the right things' – to paraphrase Drucker (c1998). This observation then has to be practically extended from the people and the structural factors to the strategic factors – therefore uniting the concerns of leadership which are normally investigated in isolation.

Combining the views of Goldman (1998)and Casler (2012), effective organisational agility can be seen as an organisational dynamic capability, which is aligned with culture, strategy and leadership, to achieve renewable competitive advantage through continuous adaptation in a turbulent environment. *"The focus of agility remains the individual and capability development of the individual"* (Bowles, 2005) which returns to the employee focus of the leader. As McCann points out it is the individual who bears the brunt of change (McCann & Selsky, 2012, p. 9) Therefore it would arguably follow that a leader has to recognise the need to promote agility within individuals and also to permit or construct the necessary organisational systems to express and act on the necessary output from an agile system. Thus, leadership requires a suite of capabilities to recognise the linkages between turbulence, its impact on the individual, the organisation, and strategic direction and identify the actions required to change the organisation to anticipate and respond in ways which allow the organisation to adapt, survive and to achieve its strategic goals.

This combination of human, organisational and strategic skills in a dynamic environment reflects the demands of a VUCA (Volatile, Uncertain, Complex and Ambiguous) world (McCann & Selsky, 2012, p. 10). The sophistication increases with increase in level within the organisation and as McCann also points out *"complex organisations fail in complex ways"* (McCann & Selsky, 2012). This is anticipated in stratified systems theory (Jaques, 1986) and as Zaccaro (Zaccaro, 2001Ch 2)in a commentary on stratified systems theory points *out "problem types and decisions choices become more ambiguous, less structured, more novel, and more differentiated at higher organizational levels. This required a more complex cognitive capacity at each of the higher levels of leadership."* Arguably industry rather than academia responded to this nuanced view and developed leadership capability frameworks which acknowledge the whole of organisation commitment to leadership and leadership development. Commenting on leadership frameworks is difficult in that they are closely guarded, being a key part of corporate competitive advantage. Frameworks certainly exist in the public domain (Defence, 2010); however it has to be assumed that agility is inferred as it is not mentioned explicitly, although the US military have examined the issue (Dekker, 2006). The omission of agility from the Australian Defence Force (ADF) capability framework suggests that unless agility is directly considered it cannot be assumed and although agility is an essential component in modern competitive advantage (McCann & Selsky, 2012, p. 6) there has to be a conscious link made between leadership capability and agility – agility is a whole of organisation capability.

1.6 Outline of the Thesis

This thesis seeks to move the debate forward by identifying a leadership model and the attributes and behaviours (capabilities) needed for universities to be able respond to a rapidly changing world and to engage in coherent and consistent leadership development. The context will be provided by firstly looking at universities and the challenges they face, followed by a review of leadership theory leading to develop an understanding for a need for a leadership model and leadership capabilities. A set of potential leadership capabilities will be evaluated through a survey and the results analysed to gain an understanding of their validity and to define the next steps in developing a university leadership model.

Focus: In order to address the fact that response to change is a leadership issue, this thesis will examine the challenges facing university leadership through a selective study of available literature, and using the literature review, a set of modern leadership capabilities is identified. These capabilities reflect the leadership required and were derived from work outside universities.

Methodology: University staff at two institutions were surveyed, asking them to rate the capabilities in terms of both theoretical importance and in term of practical demonstration using a Likert scale. The survey results were analysed using both qualitative and bootstrap simulations.

Findings: The survey analysis confirmed that with two minor exceptions all respondents agreed that the selected capabilities were important in university leadership. The analysis also showed that the respondents' views of how well developed the capabilities were in practice demonstrated a very clear gap between importance and development of the capabilities. However, the key finding is that the capabilities were validated in terms of importance. The first step is to provide context by examining the challenges facing university leaders.

Chapter 2 Literature Review

2.1 Understanding the Challenges

In the 1970s and the 1980s both the broadening of the student cohort and the start of the so-called fourth industrial age occurred (Peters, 2017). Universities were faced with shifts in funding, the rise of the power of university management, the demands of students, increased competition and the growing failure of universities to acknowledge that they were not meeting the needs of the workforce of the future (Moore, 2000). Whilst governments were well aware of the connection between higher education and national GDP (Brown & Heaney, 1997), there is little or no evidence that they understood how to encourage university leadership to embrace the mindsets needed to focus on graduate outcomes. However they have played a large part in increasing the student participation rates and thus have been arguably a major contributor to current leadership problems (Yielder, 2004). Certainly, these changes have called into question the concept of a university and how universities should position themselves to meet a nation's needs in the twenty first century (Halloran, 2018; Moore, 2000).

Systematically understanding the challenges facing university leadership is a key factor in understanding and defining the leadership capabilities. The leadership challenges will be examined from two points of view based on two pieces of research:

1. In the first piece of analysis from O'Mullane (2011) a summary of the survey results with a brief description is presented.
   In the second, a more wide-ranging analysis from Ramsden (2003) will be presented and the two approaches will be compared and summarized, to provide a broad understanding of the challenges to University leadership, and the capabilities required to deal with those challenges. Ramsden's work lead to the development of the Leadership for Learning model.

2.2 O'Mullane Study Justification

This insightful study (O'Mullane, 2011)was selected as it confirmed key understandings of this thesis, the purpose of this thesis and also provides a sound basis for understanding university leadership. The main points underlying the purpose of this study are as follows:

a. Confirmation of the gaps in the understanding of university leadership (O'Mullane, 2011, p. xv) .
b. The survey was based on European universities as these were seen as an exemplar for Australian universities (O'Mullane, p. xv) .
c. The author's views consistently challenged the 'naturalistic development' opinion held by many academics (O'Mullane, p. 142)

d. That the development of organisational leadership is defined by the organisational challenges (O'Mullane, p. 28)
e. The development of leadership competencies needs further research (O'Mullane, p. 142)

2.3 O'Mullane Study – Survey Design

The survey was designed to address gaps in the understanding of university leadership (O'Mullane, 2011, p. 27) which were seen as follows:

1. Poor understanding of how academics and non-academics perceive the approaches to university leadership.
2. The gap between perceptions of leadership in higher education and theory and practise in the broader leadership space.
3. The expectations of university leadership.
4. The lack of studies into how university leadership capacity is developed.
5. The need to understand the challenges faced by university leadership given the continuing environmental uncertainties.

In order to address these gaps three core questions were identified:

1. What approaches do universities take towards their leadership and management?
2. How are leadership and management developed?
3. What leadership challenges facing universities?
4.

The survey sample was based on a trans-sectional sample (O'Mullane, p. 45) across ninety seven (97) individuals in twenty three (23) organisations.

The format was a semi-structured interview process (O'Mullane, p. 52) and the transcripts were analysed using pattern matching to define common concepts grouped under each research question (O'Mullane, p. 55).

O'Mullane's survey was carried out at a time of critical change within higher education and identifies critical gaps in the understanding of university leadership as well as challenges posed by the attitude of academics to leadership (O'Mullane, 2011, p. 124)

2.4 Summary of O'Mullane's findings

O'Mullane saw the multiple challenges to university leaders arising from the poor quality of university leadership due in part to academics being distracted by personal career issues and their poor understanding of leadership in an academic setting. The challenge of maintaining the quality of the taught program in terms of standards and relevance as well as the need to have a more global perspective reflected in the course material. Staffing was a major problem with the two main

challenges were lack of staff qualifications, shortages of qualified staff, poor motivation and a poor attitude to work. Also, formal qualifications for staff i.e. PhD or equivalent was a concern, although senior leaders spoke about their staff's expertise – recognizing successful academics without qualifications. Poor motivation was often linked to pay, and conditions and poor attitudes were attributed to the capacity for self-directed research and tasking coming under threat.
Externally increased competition from other universities impacts course quality and funding, research profile. Plus increasing pressure from non-university educators reflecting pressure from industry which feels that university graduates are not ready for the workplace. As well as increased political interference and internal interference from university councils.

Restructuring and amalgamations give rise to unresolved cultural clashes and brought historical rivalries onto the same campus whilst facing the task of developing, maintaining the university character and reputation particularly from a traditional point of view.

Although research is considered as a core, if not the core, activity of a university, it was ranked as the joint least-important factor in leadership challenges. The need to establish a research culture was identified as a problem in the new universities; as was the impact of focusing on research to the detriment of teaching quality. Together with research, the other main function of a university, and of equal concern, is student education. The main concerns expressed were around student satisfaction and the poor quality of the students. Alternatively the challenges can also be broadly categorised based on the work of Ramsden (2003). Meeting the perceived leadership challenges requires organisational change and what this in turn requires is best understood by analyzing the challenges. Academic leadership styles reflect the preoccupations of academics but this may not be what a university needs and of concern is the fact that academics did not recognise that they needed leadership training (O'Mullane, 2011).

2.5 Ramsden's View

Using the work of Ramsden, a more descriptive understanding of university leadership challenges can be laid out under what he refers to as presage factors (Ramsden, 2003, p. 12)

Ramsden uses a similar argument as O'Mullane in that understanding the challenges faced by university leadership would allow sustained productivity through staff training and development (p. 12). This in turn would lead to the necessary changes to university culture which is the critical role played by leaders.

A clearer understanding of the challenges faced by university leadership can be made using the five factors used by Ramsden namely:

- Mass education and the growth of knowledge

- Substantive Knowledge
- Information Technology
- Academic Work
- Academic Values and Culture

Ramsden's approach was that university leadership is best understood through an understanding of the day to day work of the academic (Ramsden, 1991, p. 13). The following commentary summarises Ramsdens analysis.

Mass education and the growth of knowledge

Since the 1970s higher education has moved from an elite system which catered for capable, highly motivated students to a system of mass education with the corresponding decline in student ability. External forces from technology, funding and student expectations have fundamentally altered how academics work. Universities or rather higher education has become big business (Ball, 2012). Increased complexity and competition in the marketplace, technology, contract employment and performance management clash with academic values and practices of the more elite institutions. At the same time the number of professions which now require a degree has risen sharply. More is expected from academics with fewer resources and the character of the students has changed from gifted and motivated, to cohorts more like school students – this creates additional demands on academic time (Boyer, 1994). As students pay more of the tuition costs, they have become increasingly demanding and critical of bad teaching and at the same time the student quality has declined. Furthermore, technology opens the door to more cost-effective competitors. It falls to the academic leader to navigate the changes whilst simultaneously meeting student expectations and supporting their academic colleagues in doing so.

Substantive Knowledge

Performance-based funding of research has increased the quantity but not the quality of the research as universities pursue knowledge which can be applied to valid problems. This has led to the expectation that universities need to become more entrepreneurial and innovative. The traditional research universities have a great advantage in this area. However, for new universities, the pressure to increase research, particularly as it is linked to rankings, means that teaching intensive academics feel marginalized.

Information Technology

Information technology in higher education has seen the rise of flexible learning in terms of universities starting to use learning management systems, thus allowing greater numbers of distance

students. It has forced academics to learn new skills moving from the transmission of knowledge to becoming involved in the process of learning – both face-to-face and on-line.

Academic Work

The status of the academic and academic work has been eroded by a move to more bureaucratic management and by a customer-driven view of quality, as has the autonomy of academics to be able to influence their own work. Being an academic was highly regarded but public respect for the profession is in decline (Ramsden, 2003, p. 19).

The change in the academic workload, academic pay and the move towards a more accountable level of performance represents a significant challenge to the modern academic.

Academic Values and Culture

Ramsden observed that the operational management of a university has evolved but the leadership and management of people is still a long way behind with corporate management being referred to as a 'nasty virus' (Ramsden, 2003, p. 21). Whilst the academic and academic values and culture can be examined in depth, the cause of dissonance between management and academics remain rooted in a promotion system which wholly recognises research output over teaching performance; a traditional tolerance for academics to determine their own work responsibilities and heads of department who do not acknowledge or understand that they have a staff development responsibility.

2.6 Compounding the Challenges Faced by University Leadership

Whilst the scope of the challenge has been described above and the assertion made that the solutions to these challenges are a leadership issue, there is a persistent view amongst academics that they are natural leaders and do not need training, whilst maintaining that administrative staff do need leadership training (O'Mullane, 2011, p. 89). Moreover, the innate conservatism of the sector is reflected in O'Mullane's survey results, given below, setting out why universities are slow to innovate. The factors which are impediments to university innovation revolve around the deep-seated conservatism of university cultures and the aversion to risk-taking among many management teams – especially from governing bodies. The constraints of inflexible organisational structures and processes, reinforced by resistance to change from parts of an ageing academic workforce and from external regulatory bodies. The fragmented and tentative nature of change initiatives within universities are often contained within particular departments, programmes or student groups, and not adopted more widely. A perceived lack of incentives for innovation, given that most institutions remain relatively well-funded, with student demand and revenues remaining strong. Improved confidence in the resilience of the sector, with far fewer vice-chancellors predicting institutional failures and forced mergers than in previous years (Boxall, 2015).

Having outlined the challenges, the next step is to examine the literature to better understand university leadership and to identify the progress, if any, towards leadership capability development.

2.7 Literature Search

Educational experts anticipating technology driven change have been calling for reform since the late 1990s (Brown, 1999; Ernst, 2011; Laseter, 2012); however a recent survey of UK vice chancellors concluded that university leadership feels little incentive to meet calls for change (Boxall, 2015). Reinforcing this reluctance to change are research findings that show that many senior academics believe they do not need any leadership development (O'Mullane, 2011) which may be a contributing factor to the noted lack of research into university leadership (Scott, 2011). The commercial sector, however, has been enthusiastic in embracing leadership models, often based on the work of academics such as Bass, Bennis ,Burns, Drucker, Posner and Vroom and Yukl (Bass & Bass, 2008; Bennis, 2009; Burns, 1978; Drucker, 2012; Posner & Kouzes, 1988; Vroom & Yetton, 1973; Yukl, 2010).

This thesis provides: (a) a summary of the evolution of leadership theory, (b) a review of research into university leadership and then identifies a leadership model for universities, derived from education sector-based research.

This literature review has two objectives:

1. To examine the research supporting the Leadership for Learning Model (L4L) proposed by Townsend and Mc Beath (2011).
2. To identify capabilities from the literature which will form the basis for a survey to test the components of a leadership model for higher education.

Leadership as a recognizable phenomenon has been in existence since biblical times; however it has only existed as a subject for research since the early twentieth century (Bass & Bass, 2008). Burns (1978, p. 2) describes leadership as '*one of the most observed and least understood phenomena on earth.*' Looking at the development of leadership theory Muijis (2011) describes the field as '*often undertheorized and overly simplistic.*' Therefore, to define the scope of the survey of university leadership this literature review will examine the following:

- Differentiating leadership from management
- Identity
- Review of the L4L model
- Database Search and identification of a leadership capabilities

- Survey design based on the forgoing literature review

2.8 Differentiating Leadership from Management

It is valuable to clarify the distinction between leadership and management rather than use the two terms interchangeably. The work by John Kotter (2000) sets out a clear distinction between the two terms whilst accepting that they are interdepended. Kotter's view can be summarized as follows: *Companies manage complexity by planning and budgeting, by organizing and staffing, and by controlling and problem solving. By contrast, leading an organization to constructive change involves setting a direction (developing a vision of the future and strategies to achieve the vision), aligning people, and motivating and inspiring them to keep moving in the right direction.(Kotter, 2000, p. 54)*.

This distinction was used as a frame of reference in this literature review and in the construction of the survey. Furthermore, different theories are used to determine a more useful definition of leadership and to differentiate it from management/transactional approaches. Leadership is a dynamic skill and therefore the definition must be flexible and anticipate future states, not just current states. One of the reasons for making this distinction is the unresolved tension between leadership and management which lies at the heart of one of the key problems in understanding universities – that of identity (Bolden et al., 2012).

A persistent issue is the modern academic leader being caught between the forces of academic duties and management pressures (Albert, 2004; Bolden et al., 2012; Bryman, 2007). Furthermore, much of the work published focuses on leadership of academic institutions and does not consider leadership of academics and academic work (Macfarlane, 2011; Middlehurst, 2008). This tension can be seen as being possibly aggravated by the perceived rise of the university administrators over the last two decades and perceived power struggles which continue to this day (Sheperd, 2017; Williams, 2017; Zoller & Fairhurst, 2007).

2.9 Literature Review Search Rationale

A literature database search was carried out in order discover if any work has been carried out to develop a leadership model for higher education; and to determine whether leadership capabilities (which could constitute a basis for a model) had been identified or proposed in a higher education context.

Bearing in mind the lack of research in this area the literature search was divided into two parts a) keyword search of the following data bases ERIC and Scopus plus a search of Google Scholar and a targeted search guided by key books and unpublished but critical developments in the education and broader leadership literature. The ERIC and Scopus databases were selected because they were

focused on education and keyword searches for peer reviewed articles over the period 2007-2017 for the key words: *"Leadership capabilities", "Leadership model", "Leadership framework"*. The results were as presented in Table 2-1.

Table 2-1:Database Search Results

Search Term	ERIC via EBSCO	SCOPUS	Valid Results	
			ERIC	SCOPUS
Leadership model	50	652	1	
Leadership capabilities	22	252	2	2
Leadership framework	32	97	3	

Although there were many titles containing the search terms, most of these were excluded because either they did not apply to university or higher education leadership or their application was far too narrow or specific to make them useful. However, these searches yielded two key papers, which formed the basis for this line of research. These papers were (Scott et al., 2008) and (Ghasemy et al., 2016). Ghasemy's paper builds on Scott's earlier work that identified and surveyed academics about a range of leadership related capabilities. This model combines three groups of leadership capabilities with two groups of leadership related competencies (Figure2.2)

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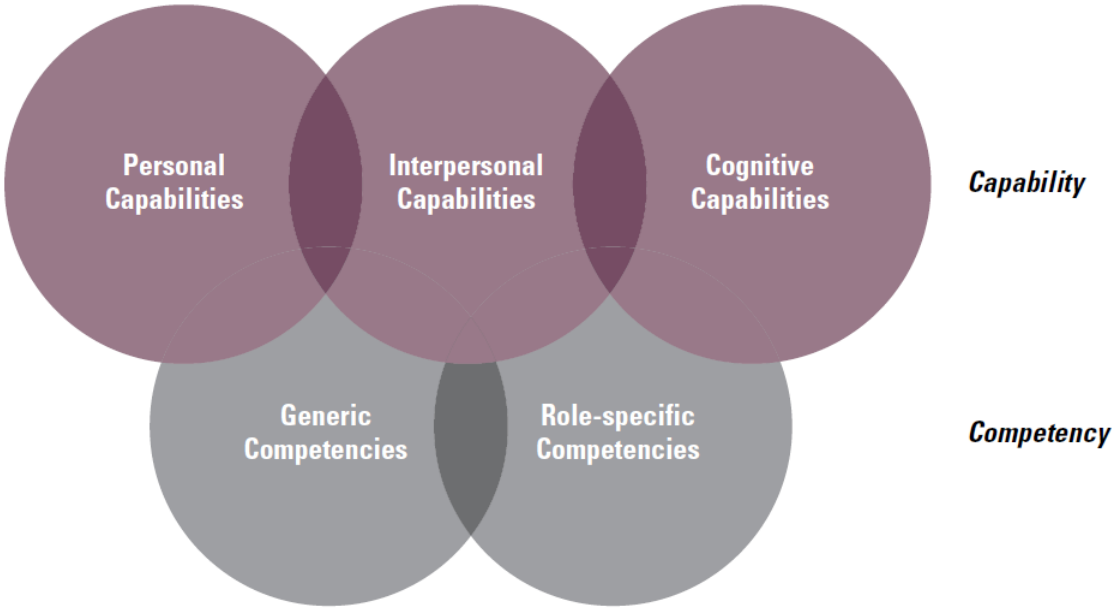

Figure 2-1 : Academic Leadership Capability Framework

(Scott, 2008)

This paper references the work of Ramsden (2003) but does not refer to the essential connection made by Ramsden – namely that there is a direct connection between leadership effectiveness and transformational leadership in an academic institution (Ramsden, 2003, pp. 66,68,127). This is important because it suggests that the evolution from the Scott/Ghasemy model to a more nuanced approach must include the recognition of change-induced turbulence referred to in this review that is the focus of transformational leadership. Research and expert commentary on turbulence/agility and resilience (McCann & Selsky, 2012) makes the link between agility and leadership. Forward looking commentary (Cawood, 2018) examined the landscape universities will find themselves in, and further commentary also examines the response (or lack of it) of universities to the acknowledged need to change (Boxall, 2015).

A further directed literature search revealed three relevant capability frameworks. One was educationally based and produced by the Australian Council for Educational Leaders (ACEL) (2018) and the second was produced by The Institute for Working Futures' *Leadership and Management for the Digital Age* (LaMDA capability framework) (Bowles, 2015) to specifically deal with the core capabilities required in the future workforce . The third paper, as referenced above, establishes a core set of leadership capabilities which can be used as a foundation for developing organizationally specific capability frameworks. A direct comparison between these all three models reveals that the LaMDA model has one key element ignored by the other two namely the capability to lead change that is the issue at the heart of the higher education leadership narrative. Therefore, given it can be argued that these models represent a development in thinking and the additional change element found in the LaMDA model.

More recent work (Bowles, Harris, & Wilson, 2016) was undertaken to review available leadership capabilities framework to establish common leadership capabilities across multiple organisations. This research successfully established a valid foundation for leadership capability development frameworks by the identification of twelve leadership capabilities across five broad themes. The leadership capabilities the research identified were:

1. Future Orientation and Vision
2. Develop and Empower Others
3. Inspire and (Emotionally) Engage People
4. Change and Innovation
5. Integrity and Adherence to Standards
6. Results Orientation
7. Self-Awareness and Courage
8. Critical Thinking
9. Collaboration and Influence
10. Ethical and Cultural Awareness
11. Communication and Relationship Management
12. Technical Mastery

The key thematic areas encapsulating the above were:

1. Self-awareness
2. Interpersonal communication, collaboration and engagement
3. Inspire and develop others
4. Leadership of change and innovation
5. The ability to think and act strategically

This confirmation and the fact that these capabilities were common across many organisations supported the testing of these capabilities across two universities using a survey. The survey elements were based on the 2015 LaMDA model as modified by subsequent operational insights (Bowles, personal communication). The focus on L4L and the LaMDA models acknowledges that universities are both educational organisations and corporate businesses.

2.10 Statistical Testing

The data for this research was gathered using a survey based on the well-established Likert scale because it allows for the respondent to express a range of opinions in answer to a question. The Likert scale was developed by Dr Rensis Likert, a sociologist at the University of Michigan (Bertram, 2007) as a means of understanding and analysing people's attitudes or preferences on a particular topic. A typical range of responses in a Likert based questionnaire would be Strongly disagree, Disagree, Neither agree nor disagree, Agree or Strongly agree.

The data produced by Likert -type surveys is typically considered to be ordinal in nature. Ordinal data, as a classification was proposed by Stevens (2008) and represents data which displays rankings but does not give relative degrees of difference i.e. it only allows for comparative deductions to be made. This determines the statistical tests which may be applied to such data sets (Allen & Seaman, 2007). However, analysis of Likert data in particular is a source of much controversy and debate amongst academics (Norman, 2010). In order to avoid this controversy, the statistical analysis was done to each set of data separately using bootstrap based hypothesis testing to determine the level of agreement (H_0 all respondents agree) around the two questions of importance and development.

Chapter 3 Leadership - Theoretical and Conceptual Framework

3.1 Underlying Theory Understanding leadership using leadership theory

Leadership is a universal phenomenon which has been recognised since the beginning of civilisation and its acceptable patterns of behaviour differ from time to time and from culture to culture (Bass & Bass, 2008, pp. 3-4). The early twentieth century saw the beginning of the study of leadership as psychology became established as a discipline (Freud, 2018) and as national conflicts drove a need to understand and develop leadership (Kohs & Irle, 1920). Set out below are the major developmental steps in leadership theory reflecting the movement from the first and second industrial revolutions to complexity of the fourth industrial age (Bacon, 2018).

Great Man Theory

The first formal leadership theories were based on the personalities of great leaders (Carlyle, 1840; Galton, 1869) . This theory looks at leadership in terms of power (French Jr, 1956) and considers leaders as the dominant member of a leader-follower dyad as per Schenk (as cited in Van Seters & Field, 1990). However this was seen a limited theory because effective leaders have very different personalities, which are, in any case, difficult to imitate by practicing leaders (Van Seters & Field, 1990).

Trait Theory

Traits, as measures of personality, can be defined as habitual patterns of behavior, thought, and emotion and are confirmed valid predictors of diverse job-related criteria (Goldberg, 1993). Trait theory shifted the focus from the imitation of specific individuals to the acquisition of desirable traits. However the connection of particular traits to leadership was initially considered tenuous (Jenkins, 1947) but further work (Costa Jr & McCrae, 1992; McCrae & Costa Jr, 1997) shows that they are valid as explanatory variables in contemporary leadership theory (Fiedler, 1964).

Behaviour Theory

In order to understand leadership in ways which were transferrable, behaviour theory is based on observing what leaders do and thus is defined as a subset of human behavior (Fleishman & Harris, 1962). This was a major advance because leaders wishing to improve their effectiveness can adopt approved behaviours.

Contingency/Situational Theory

This theory acknowledged earlier theories and sought, for example, to place, train or select leaders for specific situations - Fiedler's Contingency Theory (Fiedler, 1964) or to provide enabling conditions - House's Path Goal Theory (House & Mitchell, 1975). This theory acknowledged the importance of

factors outside the control of leaders and in turn determined the traits, capabilities and behaviours needed for effective leadership (Bass & Bass, 2008). The Normative Model (Vroom & Yetton, 1973) that prescribed a leader's behaviour according to the situation further modified this. Situational theory was first proposed by Hersey and Blanchard (1969), and Caskey (1988) as quoted by Fernandez and Vecchio (1997) describes Situational Theory as straightforward and appealing. However Fernandez and Vecchio conclude that "*Hersey and Blanchard's theory may be of greatest value to the extent that it reminds us that it is essential to treat individual subordinates differently as the situation changes; and that we be aware of opportunities to build subordinate skills and confidence, rather than assume that a given subordinate, lacking skills or motivation, must always remain a "problem employee." (Fernandez & Vecchio, 1997)*

Transactional Theory

Transactional theory which is based on influence and looks at the exchange between leader and subordinate in terms of reward, goal attainment, goal attainment, esteem and status (Hollander, 1958; Jacobs, 1970). This theory has its origins in Weber's work on bureaucracy (Weber, 2013, pp. 196-244) which emphasised authority and hierarchy; in Maslow's hierarchy of needs in which managers needed to consider the needs and aspirations of their staff and in McGregor's Theory X and Theory Y (1960), where Theory X can be seen as scientific management and under this theory workers are assumed to need external motivation to carry out their duties. Transactional theory is often contrasted with transformational theory (Avolio & Bass, 2001) and Yukl held the view that leaders may switch between the two types (1989).

Servant/Steward Leadership

Servant and Stewardship leadership can be seen as serving a purpose other than the self. Servant leadership was first developed by Greenleaf (1997) and carried on by Spears (1995, 2010). In servant leadership power only has one use: service (Nair, 1994, p. 59). Stewardship leadership is presented as a form of leadership which places the needs of the organisation before that of the individual (Davis, Schoorman, & Donaldson, 1997). Both these forms of leadership can be seen as contributing to the development of transformational leadership through the emphasis on one of the four key features of transformational leadership namely *"individualised consideration"* proposed by Bass (1985) which focuses on the needs of the followers.

Transformational Theory

Downton (1973) as cited in Bass (2008, p. 618) first mentioned transformational leadership but it was Burns who started to develop a theory of transformational leadership (1978) in contradistinction to transactional leadership. Bass (1985) developed the work of Burns into what Conger (1999) and Hunt (1999) refer to as a paradigm shift in the field of leadership theory. Yukl

describes transformational leadership as "*a process of building commitment to organizational objectives and then empowering followers to accomplish those objectives (2013).*

This theory is based on the concept that leadership is a macro function of the whole organization and that the focus should be one of increasing quality through management of expectations (Athos & Pascale, 1981; Ouchi, 1982; Peters, Waterman, & Jones, 1982). This led to the development of transformational leadership theory, which requires leaders to be proactive, innovative and creative in building a culture of high expectations (Posner & Kouzes, 1988). Avolio worked with Bass to considered the impact of transformational leadership on organisational culture (Bass & Avolio, 1993) and to develop the Multifactor Leadership Questionnaire as a means of assessing the degree of transformational leadership (Bass & Avolio, 1997). Riggio in collaboration with Bass (Bass & Riggio, 2006) and others has extended the research through the consideration of the impact of transformational leadership on moral identity (Zhu, Riggio, Avolio, & Sosik, 2011); ethics (Zhu, Sosik, Riggio, & Yang, 2012) and empowerment (Zhu et al., 2012).

Current research has been evaluating contextual impacts on transformational leadership (Eberly, Bluhm, Guarana, Avolio, & Hannah, 2017) and considering the refinement of the theory through dual focus transformational leadership (Dong, Bartol, Zhang, & Li, 2017).

The above narrative outlines a broad view of the development of leadership theory and whilst researchers have pointed out the need for a more integrated theory (Stogdill, 1975; Van Seters & Field, 1990) this is very much a valuable work in progress.

An alternative approach to leadership is to attempt to understand it from a practitioner point of view by the analysis of leadership surveys designed to identify the commonly held views of which capabilities which constitute leadership.

Understanding leadership using data from surveys and interviews

The fast moving and contextual nature of research and writing on leadership means that many authors and commentators use surveys and interviews as a way of gathering data to support their hypotheses and their writing. The focus of these surveys and interviews is often to confirm selected leadership theories and will therefore have a particular focus such as; leadership traits (McQuaig, 2016); characteristics (Ramsden, 2003); competencies (Giles, 2016) and behaviours (O'Mullane, 2011). Furthermore many writers use publications such as the Harvard Business Review to promulgate their findings – again supporting the observation that practicing managers are only exposed to narrow elements of the leadership equation (Van Seters & Field, 1990). This reflects the need for accessible information for time poor leadership practitioners and also the power of expert opinion pieces. There is a big difference between peer-reviewed leadership research and expert opinion articles and books (Wilkinson, 2016); however survey and interview data published in peer-reviewed journals remains a valuable source of insight and commentary – but it has less well-

developed evolution than the theory and papers based on metanalysis (Schmidt & Hunter, 2014) or through a bespoke structured database search.

Leadership – Moving Towards a Model

The leadership theory and data discussed so far broadly demonstrates that the understanding of leadership has been confined to traits, behaviours, context, skills and relationships. Leadership theory remains descriptive and a proxy for actual leadership (Sundheim, 2014) and whilst there may a desire to identify an all-inclusive leadership theory (Mango, 2018) the alternate view is to understand leadership within specific contexts. The L4L leadership model demonstrated in the literature review Macbeath (2005), was further developed by Dempster (2012) placed leadership in a specific context with a specific goal – learning and a series of supporting factors such a curriculum and teaching. This then provides the focus and the framework which can be populated with context specific capabilities.

The purpose of a leadership model is to provide a framework which will support the required capabilities by identifying the desired main areas of focus – such as "Shared moral purpose" for which a required set of capabilities can be developed and thus focus the research on the subsidiary research question "*Is there a set of leadership capabilities which might be adapted to higher education?".*

For this work to be based on existing research the only available model was the educationally based L4L model as the framework on which a set of modified capabilities developed outside higher education could be based and a process of testing and refinement could be undertaken.

3.2 Theoretical Framework Review of the L4L Model

The literature review uses the seminal publication *International Handbook of Leadership for Learning (Townsend & MacBeath, 2011)* as the starting point. This publication sets out a comprehensive view of the origins, theory and practise of L4L across the globe. As previously noted the educational leadership literature acknowledges the work on leadership done in industry but Townsend's comment about the baggage of leadership (2011, p. 3) may illustrate the challenges facing the development of leadership theory in an educational setting. A review of the papers within the International Handbook highlighted those which addressed leadership theory and its development and are summarised in Table 3-1.

Table 3-1: International Handbook of Leadership for Learning – Key Theoretical Findings

International Handbook of Leadership for Learning Key papers				Theoretical Observations							
				Education not comfortable with leadership	Instructional Leadership the most prevalent model	Self is more important than learning agendas	The principal makes the difference to student outcomes	Core Leadership Practises Identified	Educational leadership and its impact need a robust theoretical basis	Measures of effectiveness need to be consistent and robust.	Leadership is one of several direct contributors to academic outcomes
Title	Authors	Year	Number of Citations								
Expertise in principals' problem solving	Robinson, V. et al	1989	145	✓	✓	✓					
Student Learning in High Needs Schools: U.S. Perspectives from the International Successful School Principalship Project (ISSPP)	Jacobson, S., Johnson, L.	2011	0				✓	✓			
Researching Leadership: Towards a New Paradigm	Muijs, D.	2011	3						✓	✓	
Collaborative leadership and school improvement: Understanding the Impact on School Capacity and Student Learning	Hallinger, P., Heck, R.	2010	162						✓	✓	✓

Much of the literature confirms that the focus of the leadership efforts is on organisational effectiveness and student outcomes (Jacobson & Johnson, 2011; Townsend & MacBeath, 2011) (Muijs, 2011); (Hallinger, 2003); (Hallinger & Heck, 2010). This agreement as to common purpose maybe a valuable insight when considering university leadership and organisational purpose when contrasted against the work done in industry.

MacBeath (2011) makes an important observation that leadership and its baggage does not sit comfortably with education in certain countries – a sentiment which echoes similar observations made by Bolden (2012) about academics' inability to express any degree of consensus when trying to achieve a modicum of agreement as to the nature of leadership in education. This may be a contributing reason as to why the limited research into educational leadership reflects varying views, for example that charismatic leadership is still valid (Jacobson & Johnson, 2011), that instructional leadership is the most prevalent model (MacBeath & Townsend, 2011) or that collaborative leadership is the model supported by the data (Hallinger & Heck, 2010).

Further, the observations by Muijs (2011) that researchers into educational leadership lack a robust theoretical approach and that there is a tendency to introduce new terms without building on existing research. Sentiments which have foundations in research and findings by Heck and Hallinger (2005) who then started to apply a more rigorous data driven approach to understanding school leadership (Hallinger & Heck, 2010) and who subsequent attempts to fill the research void regarding were forced to conclude more research was required on educational leadership models and comparative analysis with advances in the corporate sector L4L (2011). This paper will focus on the work by Dempster (2012) because this draws directly on the Macbeath and Townsend model as depicted in Figure 3-1 (MacBeath et al., 2005). Dempster (2012) following the work of MacBeath and Townsend proposed a L4L model built on three core principles of *purpose, context and agency* (Figure 3-2). These principles were drawn from previous research and academic studies, particularly Hargreaves and Fink (2012), Leithwood (2005), Leithwood and Riehl (2003), and MacBeath and Dempster (MacBeath & Dempster, 2008).

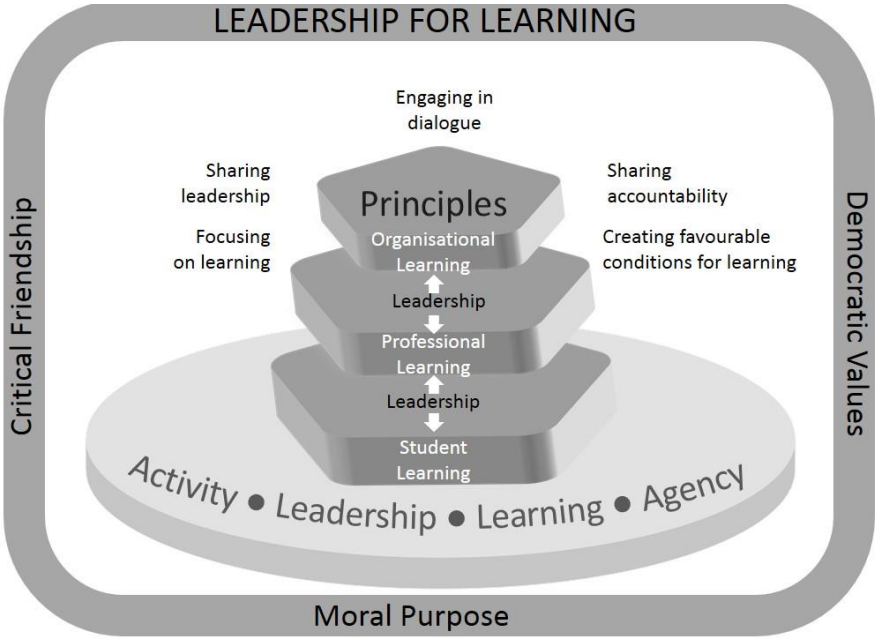

Figure 3-1: Based on MacBeath Leadership for Learning Model (MacBeath et al., 2005)

Leading Learning – A Framework *(Dempster, 2012)*

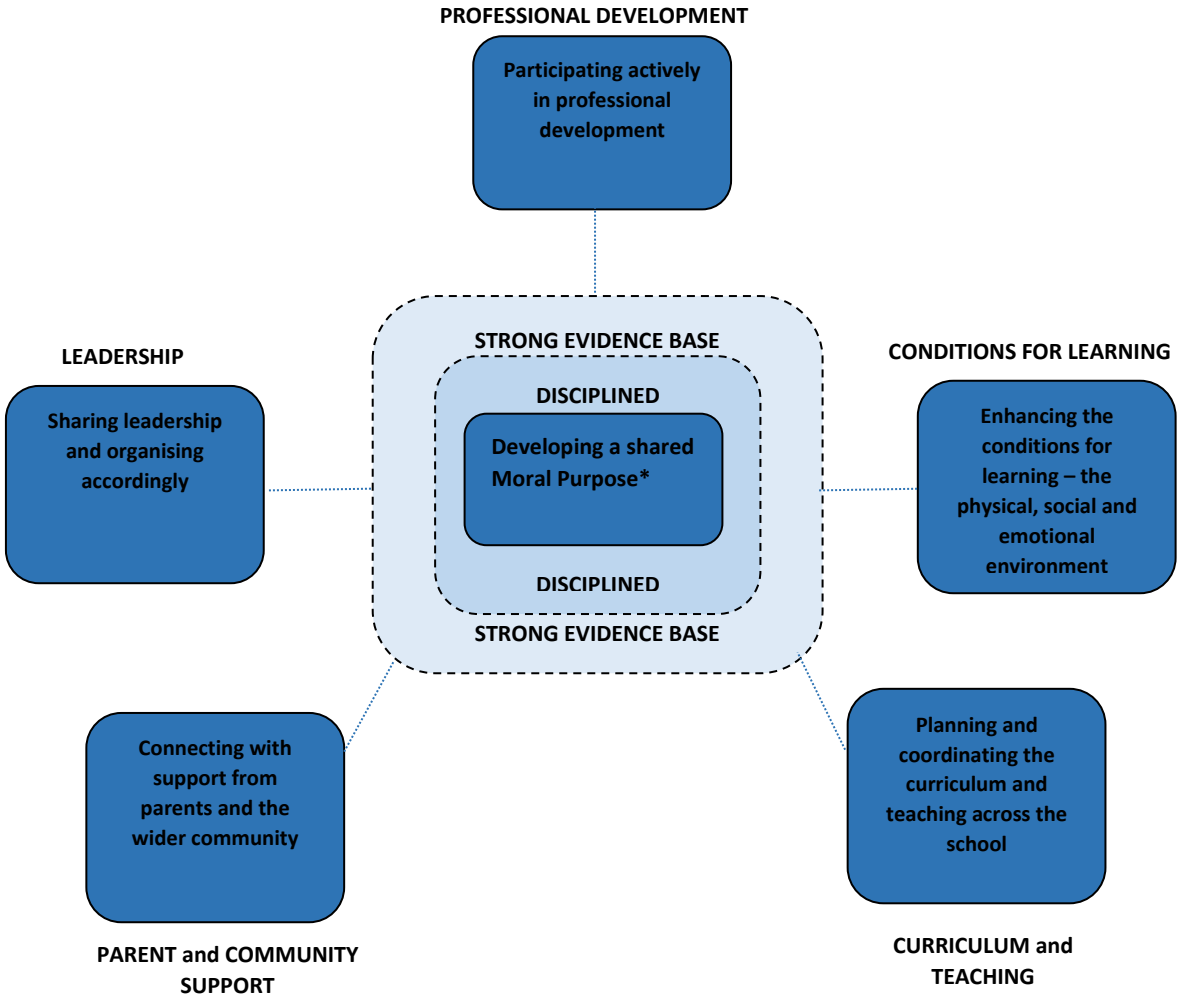

Figure 3-2 Dempster Leading Learning Model

In summary, this model links and focusses the five key factors of: i) staff professional development, ii) conditions for learning, iii) curriculum and teaching, iv) parent and community support, and v) leadership reinforcing the shared moral purpose through the mechanism of disciplined dialogue guided by a strong evidence base. Underlying this model is the assumption of deep and continuing commitment to achieving the shared purpose which constantly re-assesses the components of the model though disciplined review of evidence and data selected to provide analytics that offer insights into progress against the five key factors.

The focus of the section will now move on to the main research support underpinning each factor and will test for relevance within the literature on universities.

Professional Development

Robinson, Hohepa, and Lloyd (2009) have shown clearly that it is the principal's active participation in teacher learning and development that has the greatest effect on student learning and achievement in schools. The principal, as leader, is seen as retaining an active role through the collection, review and disciplined discussion of data on the impact of developmental learning on the classroom practice. This has been extended through the formation of Professional Learning Communities (PLCs) within schools (Vescio, Ross, & Adams, 2008); the benefit of these communities reflects not only in teacher professional development but also in student outcomes.

Focussing on higher education, the observation was made by Spendlove (2007) that in the main most universities did not systematically either identify or develop leadership skills. This may be a direct consequence of O'Mullanes (2011, p. 128) findings that suggest academics saw themselves as natural leaders and therefore were of the opinion that they had no need for leadership training. Furthermore, Burgoyne's (2009) survey of all higher education institutions in the UK reinforced and expanded on Spendlove's observation by noting that higher education failed to pay the same attention to leadership development as the business sector. He also noted that many universities lacked strategic or systems-level approaches and relied on procedural approaches to leadership development. He noted reliance on in-house short courses for training; that the annual performance appraisal was the main method of evaluation and assessment; and that whilst 78% of survey respondents believed that the investment in leadership was worthwhile this was not supported by the interview results (2009).

The most recent research from the UK Leadership Foundation for Higher Education (LFHE) (Lumby, 2012) supports other noted commentators, for example (Bryman, 2007), by concluding that academics are very resistant to the notion of leadership substantially because they regarded it as a management activity that was at odds with pure academic work; which crystallises in the completely unresolved, unacknowledged linkage between organisational identity and the importance of leadership effectiveness for a university. Tourish (2012) writing in another LFHE paper extends the commentary by noting that there was a urgent need for higher education to attach far more value to leadership development; that it should forget the notion that higher education was so different it couldn't learn vital lessons from industry and to carry out basic changes such as guiding and aligning leadership development through closer attention to strategic goals. Thus, universities need to start to develop robust models of leadership development that are systematically aligned to the institution's core purpose if they are to adopt the L4L model.

Conditions for Learning

Conditions for learning include the physical, social, and emotional conditions in which children, young people and their teachers learn (Robinson, Lloyd, & Rowe, 2008). Conditions which can be described as a culture of support and celebration, of persistence and patience, and of growth through success and failure are the essential aspects of this dimension and critical elements of leadership work (MacBeath & Dempster, 2008). Dempster (2012) admits that it is easier to collect data on student performance than on their emotional state. Therefore, whilst the importance of the conditions for learning is increasingly acknowledged, the evidence for the formal measurement of this in schools is rare. Indeed in Robinson's (2008) review of 27 school studies only two of these studies directly related to conditions for learning.

Universities have the advantage over schools of more easily being able to survey students and many universities have a well-established record of conducting studies of student's perceptions of the learning environment and academic outcomes (Ginns, Prosser, & Barrie, 2007) (Lizzio, Wilson, & Simons, 2002; Wilson* & Fowler, 2005). The foundation work was done by Biggs (2001; 1989) who developed the 3P's model (Presage, Process and Product). Researchers such as Lizzio (2002) building on Biggs's work used structural equation modelling to identify which factors aligned with the 3P's model. Ramsden (1991) developed the Course Experience Questionnaire (CEQ) that has been used in Australian National Student Surveys since 1993 and which also underpins the University Experience Survey (UES) conducted by Graduate Careers Australia. This in turn led to the work of Ginns (2007), which prompted the development of the Student Course Experience Questionnaire (SCEQ) used

annually by Sydney University which also participate in the UES, which provides useful comparative data for the group of eight research universities and for all institutions.

Curriculum and Teaching

Dempster's original paper (2012) offers little, even at a school level, by the way of practical examples of how schools monitor teaching and curriculum in order to enhance the student outcomes. Biggs (2011) has developed a considerable body of work focussing on quality teaching and does propose a self-reflective process for university departments to understand their commitment to aligning teaching with student outcomes (Biggs & Tang, 2011, p. 273). However most of this work is focused on lecturer level change (McKeachie & Svinicki, 2013) rather than at an institutional level.

There appears to be no research examining the alignment with the outcomes required by employers as an important element in achieving student outcomes. The need to align curriculum with employability has been acknowledged (Fallows & Steven, 2000) and studies confirming the need for 'soft skills' (Andrews & Higson, 2008) and entrepreneurial skills (Collins, Hannon, & Smith, 2004) needed by graduates; including work which suggested alignment between the graduate view and the employer view about the nature of the soft skills needed in the modern workplace (Tymon, 2013). However whilst the literature suggests that both schools and universities have appeared not to build in the dual feedback and review processes of teaching and curricula at institutional levels the tools do exist for such a process to be introduced. Seemingly, the nearest broadly adopted processes get are a student evaluation of generic skills through the UES and SCEQ activities discussed above.

Parent and Community Support

Dempster (2012) looks to the "*Principals as Literacy Leaders*"(PALL) project for evidence of data on parent and community support for the organisation's purpose. In the course of the work in this PALL project evaluating Dempster's L4L model the parent and community support was scored the lowest by the principals. There is a significant body of work looking at parental involvement and associated outcomes (Allen & Fraser, 2007) (Carter, 2002) (Desimone, 1999) (Zellman & Waterman, 1998) however they conclude that the principle does not easily translate into practise due to, in the opinion of the principals, a lack of commitment from the parents.

The research into the parent /student support mechanism is confined to the transition of students into a university environment (Wintre & Yaffe, 2000) (Dennis, Phinney, & Chuateco, 2005). This is reflected in typical university website information, which focusses on the management of the transition from school to university particularly for minorities.

Shared Leadership

Shared or distributed leadership (DL) can be seen as an alternative to leader centric models and presents an alternative which is socially based and embraces collegiality, consultation and academic freedom which finds deep resonance within the academic community. A reason for this resonance was explained by Townsend, Pisapia and Razzaq (2013):

"*Historically, leadership theory framed the tasks as the relationship between leaders, followers and common goals (Burns 1978; Bass 1990; Blake and Mouton 1961; Fiedler 1967; Fu and Yukl 2000; Hershey and Blanchard 1988; House 1971; Triandis 1995). This theoretical position has served well in leading people in vertical relationships [e.g. leader – follower – common goals] where command, control and persuasion tactics are the levers of change. It serves less well in leading people and groups in horizontal relationships where collaboration, co-creation, coordination, minimum specifications, chunking change, and generative processes are the levers of change (Pisapia 2009).*"

Whilst Hargreaves (2004) describes shared leadership as an essential element of sustainable school leadership Dempster (2012) admits that *"Notwithstanding the list of strategies, the principals still recorded a relatively low score for this dimension" (sic. shared leadership).* Within higher education Bolden (2009) offers the view that DL '*as a practise – a process dispersed across the organisation …. rather than residing within traits, actions and or capabilities of leaders in formal positions.'* Despite the intrinsic appeal of the model a review of the literature does not reveal convincing evidence of a DL model (Bennett, Wise, Woods, & Harvey, 2003) (Bryman, 2007). Spillane (2005) , one of the earliest commentators, suggests that "*Descriptive theory building is essential before causal links between DL, instructional improvement and student outcomes can be established.*"

In fact Bolden (2009) concluded that DL in higher education was primarily a rhetorical device offering '*an alternative to the lived experience of dislocation, disconnection, disengagement, dissipation, distance and dysfunctionality.'* The main value of DL, in spite of its resistance to modelling and dissection, is that it forms a conceptual basis for forming new understandings about higher education leadership and provides part of the intellectual framework for learning leaders. Therefore, although DL is named as a theory it has yet to be convincingly defined and whilst some elements of leadership behaviour could be ascribed to a distributed practise the tools to implement DL, and evaluate its impact on student outcomes require further work.

Moral Purpose

James MacGregor Burns developed the concept of leaders being transformational and effective leadership revolving around being able to engage and raise others to higher levels of motivation and morality (Burns, 1978). In a school setting, (Fullan, 1993) equates moral purpose with making a

difference and concerns about bringing about improvements in student outcomes. In interviews with student teachers the most frequently mentioned moral purpose, namely, "*to make a difference in the lives of students.".* Dempster (2012) reflects this when building the L4L model and states that a school's moral purpose is *"improvement in the lives of children and young people through learning".* Fullan (1993) emphasises this by stating that "*Teaching at its core is a moral profession"* and this appears to be an accepted fact of school culture.

Within universities commentators such as Balderston, (1995), as cited in (Bolden, 2012) state that from their inception in the 11th century universities have maintained a stable core and purpose by focussing on providing an environment for teaching, research and scholarly service. Other commentators such as Scott (2006) and Marginson and Sawir (2006) trace a more nuanced history showing that the purpose of universities followed a pathway which reflected the intellectual preoccupations of the time, emphasising with service to the external imperative of society and as advisers to statesmen and as valuable citizens contributing to knowledge formation and debate.

Some researchers and commentators turn to Humboldt, Newman, Robbins and Kerr for definitions of a function of a modern university as described below. Indeed, in these definitions illustrate the evolution of the broad purpose of a university.

- Humboldt - *"the whole community of scholars and students engaged in a common search for truth."* (Swain, 2011)
- Newman –*'That it is a place of teaching universal knowledge.'* (Newman, 2008, p. 11)
- Robbins – Listed four objectives essential to any properly balanced system (i) Skills development, (ii) mental development, (iii) advancement of learning and, (iv) culture and citizenship. (Robbins, 1963)
- Kerr was more direct and declared that *'universities had become a prime instrument of national purpose'* (Kerr, 2001, p. 66 65th ed.).

It could be inferred from the behaviour of Australian universities in the educational marketplace that any higher ideals of knowledge development and contribution to society is increasingly limited to research-based post graduate study (Swain, 2011). Increasing competition for domestic and international students means that that they fulfil their core teaching and purpose by treating education as a commodity or product (Marginson, 2000) and that students are seen as customers (Dearing, 1997, p. 216); (Mills, 2007; Molesworth, Nixon, & Scullion, 2011).

Thus, universities may have a well-developed sense of their traditions that shape their core purpose and values, but within a largely undifferentiated Australian university system competitiveness and survival has largely relied on older, more 'traditional' universities leveraging their perceived hierarchical position and "*social prestige and intellectual reputation"* to create advantage over more recent universities (Anderson, 2010). Therefore, in contradistinction to the current position of Learning Leaders, which clearly identifies student outcomes as the organisational purpose, universities do not appear to have collectively articulated the same clear sense of identity and purpose. Commentators on Australian universities (Star & Hammer, 2008), whilst tracing the shift in focus of universities towards more vocational outcomes, conclude their study by suggesting that Australian universities should "*regain control of the higher education agenda and renew their traditional, higher purpose" (viz. key institutions in the formation of reflective practitioners, social critics and good citizens)*.

Strong Evidence Base

The central part of the L4L model proposes that a disciplined dialogue, informed by a strong evidence base of data on the five key areas (figure 3-2), guide the improved capability of leaders and the organisation to achieve its purpose.

For many years there has been much research focused on studies collecting data and trying to understand the link between student performance and the influence of school leadership (Duke, 1987) (Hallinger, 2011) (Jacobson & Bezzina, 2008). However, the L4L model requires schools (and by extension universities) to collect and analyse data in a disciplined manner and in the areas which maintain the focus of leadership and the organisation on the key factors supporting organisational purpose. The L4L model and Dempster's work has been used as the foundation for the evaluation of a program "*to build the capacity and increase the effectiveness of principals and schools in order to improve the educational outcomes of children attending schools located in low socio-economic communities"* (Budgen, 2013). Acknowledging that the L4L model is relatively new, this research into its practical application merits further research.

Within the university sector there is a wealth of data regularly collected by the individual universities. This data focusses on the student outcomes, the teaching quality, leadership quality, and curriculum but there is little, or no data collected on the parent and community factor in the L4L model. A 2008 study into the *Teaching and learning Indicators in Australian Universities* (Chalmers) presents the broader contemporary view that performance indicators are used by universities to "*to ensure the education provided to students equips them for employment and provides the nation with a highly skilled workforce that supports economic growth."* Drawing on research and findings from

(Burke, 1998) and (Warglien & Savoia, 2001), Chalmers then goes on to state that the quality of educational program, activity and service has benefits for key stakeholders;: such as students, parents, the community, employers and industry . Thus despite research confirming that the focus of some of the performance indicators, particularly the qualitative output measures, should include parents and community.

Conclusions

Looking at the five factors : (i) staff professional development, ii) conditions for learning, iii) curriculum and teaching, iv) parent and community support, and v) leadership) and the two disciplines of at the core of continuously improving the model, evidence presented herein argues strongly for further investigation to determine the extent to which the L4L model would introduce much needed focus and discipline to leadership development and downstream benefits as leaders deploy capabilities that enable and harmonise with the institution's purpose and goals. Looking at the five elements of the model there is either significant agreement or a manageable gap between the current situation and introduction of the discipline required by the model.

i. Leadership Development

   Modern institutions universities need to develop clear leadership capability frameworks supported by clear leadership development activities measured against achievement of organisational purpose and also its impact on the other four factors. The L4L framework can, and through future research should, be compared to frameworks from commercial and public enterprises.

ii. Conditions for Learning

   Since universities collect considerable data on this aspect of their activities all that is required is for the data to be evaluated against student outcomes

iii. Curriculum Development

   The tools are available within staff and student surveys for all Australian universities to gather the data on curriculum development and its impact on the key stakeholders.

iv. Parent and Community Support

   Whilst the research does acknowledge this as a key factor in practise this is a developmental area for both schools and universities. Staff and student surveys can gather broad qualitative data on this factor.

v. Shared Leadership

Shared leadership has a strong appeal in the educational sector but again this remains a development area particularly for the impact on purpose but again also measurable within staff surveys as a starting place. This is integrated with and reliant on improved leadership development identified in point (i) above.

Moral Purpose

A review of the vision statements of the world top ten universities reveals a strong focus on teaching, research and the good of society. Therefore as both universities (Hodgkinson & Stewart, 1998) and schools (Silins & Mulford, 2002) can be seen as complex learning organisations it could be held that these three elements are requires if both organisations are to attainment their purpose.

Strong Evidence Base

The identification and collection of data to support a model drives a disciplined culture and it also forms part of the practise needed by modern organisations to deal with a turbulent environment. Universities by their nature tend to be reactive cultures with little research acknowledging the need to adopt strategic and operational agility. However, there is no evidence to suggest that universities use data to drive or inform a whole of organisation leadership model. The data is designed to advice university leadership in discrete areas which are not seen as a whole. A solid start to data collection has been established providing a foundation to use the data in a coherent model.

Capabilities and Leadership Development

Leadership development has always been the focus of business but more recently it has been recognised that there is a gap between current and future training needs (Bowles et al., 2016; Riggio, 2008). Organisations have recognised the value of leadership capability frameworks (Bolden, Gosling, Marturano, & Dennison, 2003), not only as a means of leadership development but also as a means of underpinning organisation specific capability-driven strategies (Stirna, Grabis, Henkel, & Zdravkovic, 2012; Tallman & Fladmoe-Lindquist, 2002). A successful capability-focused leadership program provides contextual relevance to the specific organisation (Thomas & O'Neal, 1998).

The term capability and its value was anticipated by Charles Savage who said that "*basis of wealth is shifting from that which is 'possessed as a commodity' to the value of human capability"* (Savage, 1996 as cited in Bowles et al., 2016). Thus, capabilities reflect where the economic value lies in the digital economy of the fourth industrial age.

The terms 'capability' and 'competency' are often used interchangeably however, particularly in an Australian context, it is necessary to distinguish between the two. A competency, which has a specific vocational educational meaning is defined as *"the skills and knowledge a person can deploy to competently perform"* (Bowles et al., 2016). Capabilities may be understood as the

> "S*kills, knowledge, attributes, and personal experience that can be applied to a standard expected in professional practice at a given level of proficiency. It is concerned with the holistic view of an individual's ability to perform in a range of contexts and their potential to improve*." (Bowles, 2016)

As Bowles (2016) notes that in a leadership context, the primary differences between a capability and a competency center upon recognition that leaders need to align employee behaviours and values to the collective culture and purpose whilst building employee satisfaction - thus contributing to the growth of human capital. If identity is defined as individual roles, culture, traits and behaviour the capability can be represented understood as follows:

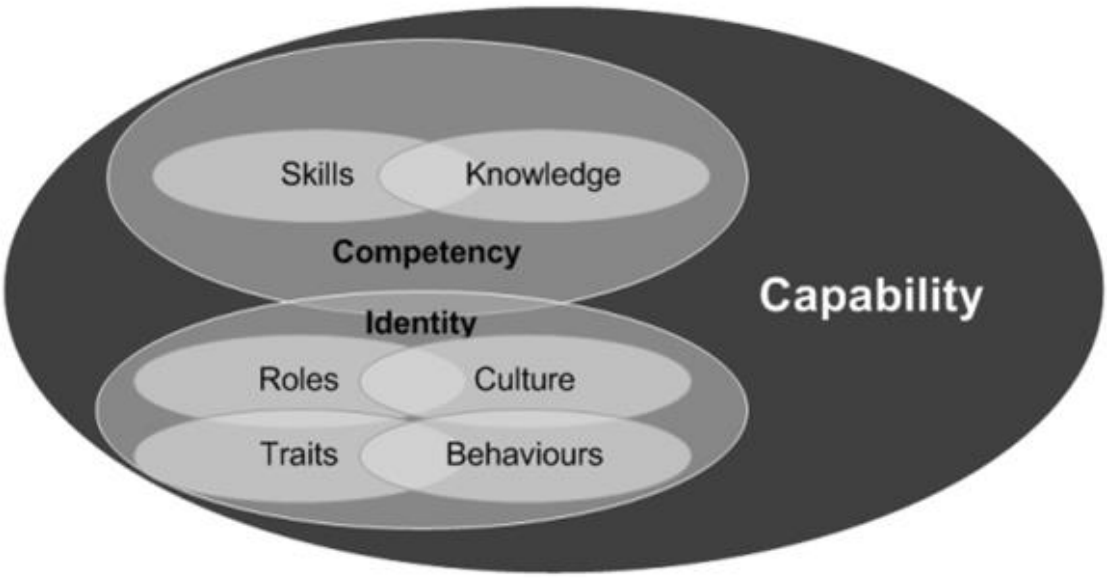

Figure 3-3 Components Making up Capabilities

(Bowles, 2007, p. 29 with permission)

This distinction is critical because it moves organisational thinking from generic skills, based only in the present, to the consideration of a holistic view of individuals grounded in the present but embracing the future. Industry, because of a growing recognition that government-funded training systems were failing to meet their needs, started to embrace leadership capability frameworks in the early 1990s (Bowles et al., 2016). Academia, however, only began to look at leadership capability

frameworks in the early 2000s (Bolden et al., 2003; Burgoyne, Hirsh, & Williams, 2004) but without, as yet, seeming to make clear connections to the future needs of the organisation or workforce nor to the competitive advantage arising from the well-established concept of an capabilities led strategy supported a capabilities framework (Stalk, Evans, & Shulman, 1992).

3.3 Conceptual Frameworks

Current work on capability frameworks in Australia is being carried out by several forward thinking organisations with a focus on the capabilities of the workforce of the future either from an educational point of view or from a professional development perspective (M. Bowles, personal communication, May 2019). These frameworks give high-level insight into the skills, knowledge, personal attributes and mindsets required for an area of work and as such can reflect the capabilities required by a specific type of organisation such as a university. The Australian Defence Force for example has developed a very well-defined leadership capability framework (ADF, 2010) based on a very specific vision and set of values. The educationally focused capability frameworks are looking at how capabilities relate to future employment and considerable analysis has been done to define 21st century skills and hence a set of forward-looking capabilities which could help define where education and education funding should be focused (M. Bowles, personal communication, May 2019).

A set of educational capabilities were derived from five frameworks which were chosen for because they are recent, involved global research and validation and had capabilities framed across multiple levels of proficiency.

1. DeakinCo., Professional Capability Standards (2016)
2. OECD, Global Workforce Core Competencies (2016)
3. Department of Education, Foundations Skills (2015)
4. World Economic Forum, Top 10 Future Skills Australia (2018)
5. Australian Industry and Skills Committee, Future Skills and training (2017)

These capabilities were then validated and mapped to future jobs as shown in Table 3-2.

Table 3-2: Organisation 1 (Educational) – Future Capabilities

Future Capabilities	I Care	I Inform	I Serve	I Create	I Grow	I Connect	I Administer	I Build
1. Personal Initiative and Drive								
2. Personal Learning and Mastery								
3. Adaptive Mindset								
4. Social Awareness								
5. Entrepreneurial and Innovative Thinking								
6. Ethics and Integrity								
7. Communication								
8. Collaboration and Relationships								
9. Critical Thinking and Judgement								
10. Problem Solving								
11. Customer Focus								
12. Creativity								

Key: GREEN is relevant to most roles and industries

RED is essential to most roles and industries

(Bowles, 2019b)

The capabilities in table 3-2 can be interpreted as in Table 3-3.

Table 3-3 Organisation 1 – Capabilities Interpreted (Bowles, 2019b)

SKILLS	O*Net EQUIVALENT	BEHAVIOURAL EQUIVALENT
1. Personal Initiative and Drive		Self-Development, Self-Management; Career Ambition; Achievement Focus; Self-Knowledge; Safety; Work-Life Balance
2. Personal Learning and Mastery		Academic Orientation; Learning Ability; Personal Learning; Self-Development; Courage; Persistence, Perseverance; Patience; Resilience; Learning on the Fly
3. Adaptive Mindset		Flexible Thinking; Growth Mindset
4. Social and Cultural Intelligence		Self-Awareness; Empathy; Compassion
5. Entrepreneurial and Innovative Thinking		Innovation Management, Leveraging Technology; Dealing with Ambiguity
6. Ethics and Integrity		Ethics and Values; Fairness to Direct Reports
7. Communication	Communicating with Persons Outside Organization; Communicating with Supervisors, Peers, or Subordinates; Oral Expression' Oral Comprehension	Influencing skills; Business Communication; Interpersonal Focus
8. Collaboration and Relationships	Establishing and Maintaining Interpersonal Relationships; Coordination; Developing and Building Teams; Communicating with Persons Outside Organization	Relationships and Influence; Team Effectiveness; Approachability; Negotiating; Peer Relationships
9. Critical Thinking and Judgement	Critical Thinking; Judgement and Decision Making	Critical Analysis; Critical thinking; Analytical Thinking; Decision Quality
10. Problem Solving	Making Decisions & Solving Problems; Problem Sensitivity	Problem Solving
11. Creativity	Thinking Creatively; Originality	Creativity

Using a basis of research and member survey an organisation is at an advanced stage of developing a set of draft organisation specific capabilities which are grouped into three domains as follows:

Table 3-3: Organisation 2 (Business) – Future

DOMAINS AND CAPABILITIES
Personal
Ethics and Integrity Acts with integrity and consistently models and promotes ethical practices.
Self-Management and Learning Manages own development and appreciate personal strengths and weaknesses and how they may impact work, learning and goal attainment.
Critical Thinking and Judgement Critically analyses, reflects and constructively challenges current thinking and practice.
Adaptive Mindset Deals with pressure, setbacks and challenges in an optimistic manner while learning from experience and responding to change and new situations in a positive manner.
Social and Cultural Sensitivity Embraces the need to be a responsible member of an increasingly global business community by working with others in an inclusive manner, respecting diversity and different values, cultures and beliefs.
Business
Communication Clearly and succinctly conveys information and ideas to individuals and groups in a variety of situations in a focused, empathetic, and compelling way that shapes others' thoughts and action.
Collaboration and Relationships Initiates and maintains authentic, strategic relationships with stakeholders and potential partners to build information, expertise and capacity to achieve business goals.
Problem Solving and Decision Making Collates and compares information from multiple sources to correctly define a problem and assess alternative solutions against decision criteria.
Customer Focus Acts in the best interests of the customer/ client and continually seeks to raise the customer experience and provide value-adding services.
Digital & Cyber Digital and cyber technology, platforms and devices are used to optimise decision making and to promote business efficiencies and controls.
Business Analysis Systematically analyses and investigates information and data to find patterns or improve business intelligence or insights.
Leadership
Future Focus Adopts a holistic and long-term perspective and is able to visualise future outcomes and opportunities.
Driving Results Drives superior results by guiding planning and monitoring, evaluating and reporting performance against strategic goals and objectives.
Leading and Developing People Leads, develops and provides feedback to enhance work, professional or personal outcomes.
Agility and Change Improves change capacity and supports organisational and cultural transformation needed to achieve strategic objectives.
Risk and Governance Enhances and assures the effective application of governance structures and risk management systems and processes.
Creativity Stimulates and promotes thinking and actions that generating ideas, new business opportunities and ways to address problems.

(Bowles, 2019a)

In both cases a process of research and refinement through survey and consultation was used.

Chapter 4 Research Methodology

4.1 Framework of the thesis

The purpose of this thesis is to identify and validate a set of leadership capabilities for university leaders in to answer the following hypothesis:

> *There are a set of identifiable leadership capabilities needed for the effective leadership of universities.*

This hypothesis will be tested by a series of subsidiary questions:

1. *What does the literature reveal about the current state of development of leadership theory?*
2. *What is the current understanding of university leadership?*
3. *Is there a set of leadership capabilities which might be adapted to higher education?*
4. *What does higher education staff survey data reveal about the proposed capabilities?*

The literature and the literature review showed that early work by Bowles (2005) and later by Scott (2008) was moving towards identifying leadership capabilities. Later work by Bowles (2015) (2016) confirmed those capabilities and a modified set of those capabilities were used as the foundation of the survey used in this thesis.

4.2 Research Design

Having identified a leadership model, the next step was to ultimately identify those capabilities deemed to be important to university leaders. The development of organisation specific capabilities is seen as a consultative and iterative process (Ghasemy et al., 2016) (Bowles, personal communication, May 2019). As Ghasemy (2016) demonstrated he identified a range of capabilities from multiple sources as a starting point. This thesis used a single source for capabilities proven in industry as a more robust starting place. The capabilities selected were a modified L4L framework (Bowles, 2015)which gave a set of sixteen (16) capabilities organised into four (4) domains. These capabilities formed the basis of the questionnaire (Appendix 1).

The data that was required was an evaluation by members of academic institutions of the importance of each capability and an evaluation of how well developed each capability was in practice. These results would then confirm that there are leadership capabilities needed for the effective leadership of universities. The results would also provide further evidence for the how well the capabilities are demonstrated in practise. Thus,

addressing the last subsidiary question" *What does higher education staff survey data reveal about the proposed capabilities?"*

Survey research is a quantitative approach which uses of self-report measures on specific populations. Surveys are well established tools in social research and the decision to use a survey is a product of the consideration of the data needed, the time and cost and the location of the target population (Ponto, 2015). Thus, a survey was constructed in which the data sought was composed of two parts a) demographic data to allow analysis by country, gender and position, and b) Likert responses for each capability. This would a) test all capabilities for relevance to higher education and b) assess the relative levels of development and therefore the developmental variance for each capability. Thus, a starting set of capabilities can be identified plus a reliable measure of how much university leadership fall short of demonstrating those capabilities in practise. (Appendix 1).

4.3 Creating the Questionnaire

The questions are founded on the work by Bowles (2005) who identified the four core domains of leadership each having three capabilities, providing a total of 12 capabilities.

A. Self-Mastery

1. Displays self-awareness
2. Communicates with clarity
3. Develops self

B. Interpersonal Mastery

4. Develops others
5. Inspires trust and commitment
6. Builds collaborative relationships

C. Process Mastery

7. Instils a focus on priority actions and outcomes
8. Fosters innovation and creativity
9. Leads change

D. Systems Mastery

10. Conveys a compelling sense of purpose

11. Thinks and acts strategically
12. Fosters a positive culture

Reflecting on the work by Scott in developing capabilities, on the educational leadership model developed by Swaffield and MacBeath (2009) and the work of Kotter (2012) an educationally focused model of the LaMDAmodel was developed. The questions were increased from three to four in each domain as follows:

A. Self-Mastery

1. Communication
2. Communicates with clarity
3. Acts in a professional and ethical manner
4. Displays personal resilience

B. Interpersonal Mastery

5. Connects with stakeholders and builds collaborative relationships
6. Leads and empowers others
7. Displays emotional judgement
8. Embraces individual and cultural differences

C. Process Mastery

9. Builds positive conditions for learning
10. Plans and coordinates quality curriculum, learning and teaching
11. Instils a focus on priority actions and educational outcomes
12. Leads change

D. Systems Mastery

13. Develops a shared moral purpose and vision
14. Fosters a learning culture
15. Thinks and acts strategically
16. Fosters innovation and creativity

Participants were from the academic and professional staff of the Australian Maritime College within the University of Tasmania (Australia) and the academic and professional staff at the University of

KwaZulu-Natal. The international nature of the survey population was to test that the capabilities were valid between countries. The survey and the collection methodology received ethics approval H 15432 from the University of Tasmania Ethics Committee.

The survey was sent to the academic and professional staff of the University of KwaZulu Natal (UKZN) and the Australian Maritime College (AMC) – an institute of the University of Tasmania in February 2016. The survey was conducted using the QuestionPro platform and was conducted over three weeks in February 2016. These institutions were identified through personal and professional relationships as being willing to collaborate. The survey requested basic demographic data – gender, country of residence, employment capacity and leadership level followed by an evaluation of a) the importance of and b) the level of development of sixteen leadership capabilities using a five level Likert scale (this being one of the most commonly used in social sciences (Bishop & Herron, 2015) (Morse, 2013)). A total of sixty-six (66) responses were received representing a 47% response rate for the AMC and an unknown response rate for UKZN because the invitation to the complete the survey was posted on a staff website and not direct email used by AMC.

Comparative analysis was used to compare the mean outcomes within both groups i.e. “importance’ and “development” and then the developmental versus importance variances. Ranking and simple statistical interrogation allowed a preliminary evaluation that there are a set of identifiable leadership capabilities needed for the effective leadership of universities. It also allows for a direct commentary on the research questions looking at the current understanding of university leadership and how university staff view the capabilities in the survey. This analysis is consistent with the work carried out by Scott (2008) and also quantitative analysis as used by Ghasemy (2016). This approach is validated by the research into analysis of Likert data done by Robbins and Heiberger (2011).

The issue with Likert data is that it is considered ordinal (i.e. it gives a ranking of latent constructs) and is there much debate about its analysis (Bishop & Herron, 2015). In order to achieve the objectives of this research the analysis of the data was undertaken in two parts. In the first part the data was analysed using comparative analysis and in the second the data was subject to bootstrap testing.

4.4 Bootstrap Analysis

To process the information from the survey, the thesis will utilize statistical analysis using Bootstrap tests. The use of Bootstrap simulation allows us to adequately and efficiently analyse the collected information and justify the findings utilizing the strengths of simulation modelling. Later, for each

question it will be possible to draw conclusions for the responses based on several parameters – gender, type of position in the organization (capacity), and geographical location (country) of respondents. The theoretical setup of the statistical testing applied in this thesis follows the philosophy of statistical testing and simulation modelling. Assume we have two one-dimensional samples of a discrete parameter *Z*, denoted as Sample 1 and Sample 2:

$$Z^1 = \left\{ z_1^1, z_2^1, ..., z_{n_1}^1 \right\} \tag{4.4.1}$$

$$Z^2 = \left\{ z_1^2, z_2^2, ..., z_{n_2}^2 \right\} \tag{4.4.2}$$

We make the following assumptions:

- the observations in Sample 1 and Sample 2 are drawn from two populations, called Population 1 and Population 2. Our objective is to define whether Population 1 has the same characteristics as Population 2
- the total number of sample observations is $n_1+n_2=n$
- the discrete parameter *Z* has *T* count of different discrete factors, indexed as 1, 2, ..., *T*
- the set $G= (g_1, g_2, \ldots, g_t)$ contains the numbers of all discrete factors that appear in Sample 1 and/or Sample 2. If *t* is 1, then all objects in both samples contain the same discrete. We shall only discuss the case, when there is at least two appearing discrete factors (i.e. $t \geq 2$).

The distribution function of Z with *T* discrete factors may be suitably interpreted by a probability mass function *p*(.) (Bertsekas & Tsitsiklis, 2000).. The function is defined over the set of real numbers, but assumes potentially non-zero values only in the set (1, 2, ..., *T*}, where it is equal to the probability p_r for the event "the discrete random variable *Z* takes discrete number *r*':

$$p(z) = P(Z = z) = \begin{cases} p_z & \text{, for } z \in \{1,2,\ldots,T\} \\ 0 & \text{, for } z \notin \{1,2,\ldots,T\} \end{cases}, \tag{4.4.3}$$

If Z has zero probability to take discrete factors that are not part of the set $G=\{g_1, g_2, \ldots, g_t\}$, then the probability mass function *p*(.) may be defined only over *G*:

$$p(g_r) = P(Z = g_r) = p_{g_r} \text{ , for } r=1, 2, \ldots, t \tag{4.4.4}$$

Assume that the count of occurrences of the discrete g_r in the i-th sample is m_r^i, for i=1, 2 and r=1, 2, …, t. We also assume that the sum of occurrence of a given discrete across the samples is $\sum_{i=1}^{2} m_r^i = s_r$. Then we are able to calculate the observed frequencies $o_{i,r}$ of the r-th discrete in the i-th sample as $o_{i,r} = m_r^i \big/ n_i$ (for r=1, 2, …, t and i=1, 2). We can also define the expected (absolute) frequency of each discrete as $e_{i,r} = s_r n_i \big/ n$ (for r=1, 2, …, t and i=1, 2). The test statistic to compare the relative sizes of observed and expected frequencies is

$$\chi^2 = \sum_{i=1}^{2} \sum_{r=1}^{t} \frac{\left(o_{i,r} - e_{i,r}\right)^2}{e_{i,r}} \tag{4.4.5}$$

The distribution of (4.4.5) may be approximated with a continuous chi-square distribution. Let us only analyze the j-th discrete g_j of ($g_j \in G$). Then observed frequencies are $o_{1,j} = m_j^1 \big/ n_1$ and $o_{2,j} = m_j^2 \big/ n_2$. If $m_j^1 \geq 5$, $m_j^2 \geq 5$, $n_1 - m_j^1 \geq 5$ and $n_2 - m_j^2 \geq 5$, then the difference $\Delta_j = o_{1,j} - o_{2,j}$ is normally distributed with mean of 0, and

$$\sigma\left(\Delta_j\right) = \sqrt{p_{0,j}\left(1 - p_{0,j}\right)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}, \tag{4.4.6}$$

where $\hat{p}_{0,j} = \dfrac{m_j^1 + m_j^2}{n_1 + n_2}$ is the pooled probability estimate for the j-the discrete factor. The null hypothesis is H_0: $o_{1,j} - o_{2,j} = 0$ and the test statistic is

$$Z = \frac{o_{1,j} - o_{2,j}}{\sigma\left(\Delta\right)} \tag{4.4.7}$$

where Z is normally distributed with mean 0 and standard deviation 1. There exists an analytical solution of the test of equality of frequencies for the j-the discrete:

$$P\left(m_j^1 = q\right) = C_{n_1}^q p_{0,j}^q \left(1 - p_{0,j}^q\right)^{n_1 - q} \tag{4.4.8}$$

$$P\left(m_j^2 = b\right) = C_{n_2}^b p_{0,j}^b \left(1 - p_{0,j}^b\right)^{n_2 - b} \tag{4.4.8}$$

The test statistic is $\Delta_j = m_j^1 \big/ n_1 - m_j^2 \big/ n_2 = o_{1,j} - o_{2,j}$. The null hypothesis is H_0: $o_{1,j} = o_{2,j}$, and then $P\left(q,b\right) = P\left(m_j^1 = q; m_j^2 = b\right) = P\left(m_j^1 = q\right)P\left(m_j^2 = b\right) = C_{n_1}^q p_{0,j}^q \left(1 - p_{0,j}^q\right)^{n_1 - q} C_{n_2}^b p_{0,j}^b \left(1 - p_{0,j}^b\right)^{n_2 - b}$. Let $o_{1,j} > o_{2,j}$. Then the one-tail test p_{value} would be:

$$p_{value}^{1s} = \sum_{q=1}^{n_1} \sum_{b=1}^{n_2} P(q,b),\ \Delta_j \le \frac{q}{n_1} - \frac{b}{n_2} \tag{4.4.9}$$

The two-tail test p_{value} would be:

$$p_{value}^{2s} = \sum_{q=1}^{n_1} \sum_{b=1}^{n_2} P(q,b),\ \Delta_j \le \frac{q}{n_1} - \frac{b}{n_2} \text{ and } -\Delta_j \ge \frac{q}{n_1} - \frac{b}{n_2} \tag{4.4.10}$$

A wide-spread approximation of $p(.)$ of a discrete variable over samples is the empirical probability mass function (EPMF), where the probabilities p_{g_r} in $p(.)$ for each event $Z=g_r$ (r=1, 2, …, t) are assessed and replaced with the relative frequencies ν_{g_r} for the same event in the sample. The corresponding EPMF for the discrete samples (4.4.11) and (4.4.12) are:

$$PMF_1(g_r) = \nu_{g_r,1} = \frac{1}{n_1} \sum_{\substack{k=1 \\ z_k^1 = g_r}}^{n_1} 1, \qquad \text{for } r=1, 2, \ldots, t \tag{4.4.11}$$

$$PMF_2(g_r) = \nu_{g_r,2} = \frac{1}{n_2} \sum_{\substack{k=1 \\ z_k^2 = g_r}}^{n_2} 1, \qquad \text{for } r=1, 2, \ldots, t \tag{4.4.12}$$

The task is to check whether the two probability mass functions $p_1(.)$ and $p_2(.)$ of the discrete random variable Z are different in the two populations. The null hypothesis H_0 is that the discrete distributions of both populations are equal, whereas the alternative hypothesis H_1 is that those distributions are different.

Assume that two probability mass functions of Z with t discrete factors, denoted as $PMF'(.)$ and $PMF''(.)$. The work (Ghasemi & Zahediasl, 2012) uses the functional Pearson statistic (PN) to estimate the difference between two arbitrary probability mass functions $PMF'(.)$ and $PMF''(.)$:

$$\begin{aligned} PN &= PN(PMF', PMF'') = \\ &= \sum_{r=1}^{t} \frac{n'\left(PMF'(g_r) - PMF_{\cup''}(g_r)\right)^2}{PMF_{\cup''}(g_r)} + \sum_{r=1}^{t} \frac{n''\left(PMF''(g_r) - PMF_{\cup''}(g_r)\right)^2}{PMF_{\cup''}(g_r)} \end{aligned} \tag{4.4.13}$$

We can prove that

$$pn_{re} = n_1 n_2 \sum_{r=1}^{t} \frac{\left(\nu_{g_r,1} - \nu_{g_r,2}\right)^2}{n_1 \nu_{g_r,1} + n_2 \nu_{g_r,2}} \tag{4.4.14}$$

The test statistic may be derived directly from the observations in the samples:

$$pn_{re} = \frac{1}{n_1 n_2} \sum_{r=1}^{t} \frac{\left(n_2 \sum_{\substack{k=1 \\ z_k^1 = g_r}}^{n_1} 1 - n_1 \sum_{\substack{k=1 \\ z_k^2 = g_r}}^{n_2} 1 \right)^2}{\sum_{\substack{k=1 \\ z_k^1 = g_r}}^{n_1} 1 + \sum_{\substack{k=1 \\ z_k^2 = g_r}}^{n_2} 1} \tag{4.4.15}$$

Perhaps the best procedure to process statistical data to assess the distribution of *PN* is via simulation using the Bootstrap method (Efron & Tibshirani, 1994). The precision of the procedure follows from the minimum assumptions of the method. The only assumption that this method makes is that the discrete samples are i.i.d. The price of this precision is the necessity to make a huge number of simple calculations, which are impossible without computer power. For that reason, the Bootstrap simulation is a computer-intensive method (Politis, 1998).

Assume that the probability mass functions in both populations are the same and equal to $p_{tr}(.)$. Those two distributions are statistically realized by the pair of discrete samples ($Z^1 - Z^2$). It is possible to calculate the real estimate pn_{re} of the Pearson statistic. We can use $p_{tr}(.)$ to generate infinite many *hypothetical* pairs of samples with n_1 and n_2 observations $\left(Z_1^1 - Z_1^2\right)$, $\left(Z_2^1 - Z_2^2\right)$, $\left(Z_3^1 - Z_3^2\right)$, ... It is possible to calculate the hypothetical realizations pn_1, pn_2, pn_3, ... of the Pearson statistic using each pair of hypothetical samples. Then pn_1, pn_2, pn_3, ... could reveal the conditional probability distribution of *PN*, if H_0 is true and pn_{re} would be one of the many possible realizations.

The difference $PN - pn_{tr} = PN - 0 = PN$ is called *root* and its distribution describes the quantitative uncertainty in the real test statistic pn_{re}. The task is to find the distribution of *root* without knowing $p_{tr}(.)$ and without having the hypothetical sample pairs $\left(Z_1^1 - Z_1^2\right)$, $\left(Z_2^1 - Z_2^2\right)$, $\left(Z_3^1 - Z_3^2\right)$, ... In the computer world, be can generate N_b synthetical pairs $\left(Z_q^{1,s} - Z_q^{2,s}\right)$, for q=1,2,…, N_b from $PMF_{1\cup 2}(.)$ to get pairs of synthetical samples:

$$Z_q^{1,s} = \left\{ z_{1,q}^{1,s}, z_{2,q}^{1,s}, ..., z_{n_1,q}^{1,s} \right\} \tag{4.4.16}$$

$$Z_q^{2,s} = \left\{ z_{1,q}^{2,s}, z_{2,q}^{2,s}, ..., z_{n_2,q}^{2,s} \right\} \tag{4.4.17}$$

For each pair, the calculate the synthetical Pearson statistic. The result is the synthetic sample $S_{PN^s} = \left\{ pn_1^s, pn_2^s, ..., pn_{N_b}^s \right\}$. Then we can obtain the distribution of PN^s approximated as empirical function

$$CDF_{PN^s}(pn) = \frac{1}{N_b} \sum_{\substack{q=1 \\ pn_q^s \le pn}}^{N_b} 1 \text{ , for } pn \in (-\infty; +\infty) \tag{4.4.18}$$

The difference $PN^s - pn_{tr,cw} = PN^s - 0 = PN^s$ is a random variable $root_{cv}$. The main assumption of the Bootstrap method is that the distribution of $root_{cv}$ in the computer world is the same as the distribution of *root* in the real world. The p_{value} is the probability to receive by chance the value of *PN*, which is at least as large as pn_{re} provided that the null hypothesis is true. Then

$$p_{value} = 1 - CDF_{PN}\left(pn_{re}\right) + P\left(PN = pn_{re}\right) = \frac{1}{N_b} \sum_{\substack{q=1 \\ pn_q^s \geq pn_{re}}}^{N_b} 1 \tag{4.4.19}$$

Next, we conduct a series of Bootstrap tests for identity of population probabilities to belong to discrete g_r. The sample estimate in use is the sample relative frequency ν_{g_r} of the same event $Z=g_r$. The task is to test whether the probabilities $p_{g_r,1}$ and $p_{g_r,2}$ for the event "the discrete random variable *Z* belongs to discrete g_r" in both populations differ. The null hypothesis $H_0^{g_r}$ is that the population probabilities for $Z=g_r$ are equal in both populations. The alternative hypotheses $H_1^{g_r}$ are different for the two-tail Bootstrap test and the one-tail Bootstrap tests. Perhaps the best procedure to calculate the distribution of Δ_{1-2}^{p,g_r}, resulting from the processing of statistical data is simulation using the Bootstrap method.

Let the probability mass distribution functions (Bertsekas & Tsitsiklis, 2000) of both populations – $p_1(.)$ and $p_2(.)$- have equal probabilities to belong to discrete g_r, equal to $p_{g_r,tr}$. Those are realized statistically using pairs of samples $(Z^1 - Z^2)$. We can generate many *hypothetical* pairs of samples from the discrete distributions $p_1(.)$ and $p_2(.)$: $\left(Z_1^1 - Z_1^2\right)$, $\left(Z_2^1 - Z_2^2\right)$, $\left(Z_3^1 - Z_3^2\right)$, ... Then the hypothetical realizations $\delta_{1-2,1}^{p,g_r}, \delta_{1-2,2}^{p,g_r}, \delta_{1-2,3}^{p,g_r}, \ldots$ could uncover the conditional distribution of the random variable Δ_{1-2}^{p,g_r}, if $H_0^{g_r}$ holds, and $\delta_{1-2,re}^{p,g_r}$ would simply be one possible realization. The difference $\Delta_{1-2}^{p,g_r} - \delta_{1-2,tr}^{p,g_r} = \Delta_{1-2}^{p,g_r} - 0 = \Delta_{1-2}^{p,g_r}$ is called *root* and its distribution entirely describes the quantitative uncertainty in the real test statistic $\delta_{1-2,re}^{p,g_r}$. The task is to find the distribution of *root* without knowing $p_1(.)$, $p_2(.)$ and $p_{g_r,tr}$ and without knowing the hypothetical pairs of samples $\left(Z_1^1 - Z_1^2\right)$, $\left(Z_2^1 - Z_2^2\right)$, $\left(Z_3^1 - Z_3^2\right)$, ... Since the true $p_1(.)$, $p_2(.)$ and $p_{g_r,tr}$ are unknown, then they may be replaced by their estimates. If $H_0^{g_r}$ is true, then the unknown probabilities for $Z=g_r$ in both populations $p_{g_r,tr}$ may be replaced by the relative frequency ν_{g_r} of the event $Z=g_r$, calculated on the observations in both samples:

$$v_{g_r} = \frac{n_1 v_{g_r,1} + n_2 v_{g_r,2}}{n_1 + n_2} = \frac{\sum_{\substack{k=1 \\ z_k^1 = g_r}}^{n_1} 1 + \sum_{\substack{k=1 \\ z_k^2 = g_r}}^{n_2} 1}{n_1 + n_2} \tag{4.4.20}$$

In the computer world, the unknown $p_1(.)$ and $p_2(.)$ of both populations are replaced by their estimates $PMF_{1\cup 2}(.)$. In the computer world, we can generate N_b synthetic pairs of samples $\left(Z_q^{1,s} - Z_q^{2,s}\right)$ for q=1, 2,…,N_b from the known $PMF_{1\cup 2}(.) = PMF_1(.) = PMF_1(.)$:

$$Z_q^{1,s} = \left\{ z_{1,q}^{1,s}, z_{2,q}^{1,s}, \ldots, z_{n_1,q}^{1,s} \right\} \tag{4.4.21}$$

$$Z_q^{2,s} = \left\{ z_{1,q}^{2,s}, z_{2,q}^{2,s}, \ldots, z_{n_2,q}^{2,s} \right\} \tag{4.4.22}$$

We can calculate the synthetic test statistic for the q-th pair of samples $\left(Z_q^{1,s} - Z_q^{2,s}\right)$:

$$\delta_{1-2,q}^{p,g_r,s} = \frac{1}{n_1} \sum_{\substack{k=1 \\ z_{k,q}^{1,s} = g_r}}^{n_1} 1 - \frac{1}{n_2} \sum_{\substack{k=1 \\ z_{k,q}^{2,s} = g_r}}^{n_2} 1 \tag{4.4.23}$$

The cumulative distribution function of $\Delta_{1-2}^{p,g_r,s}$ may be approximated as the empirical CDF, constructed over $S_{\Delta_{1-2}^{p,g_r,s}}$:

$$CDF_{\Delta_{1-2}^{p,g_r,s}}(\delta) = \frac{1}{N_b} \sum_{\substack{q=1 \\ \delta_{1-2,q}^{p,g_r,s} \le \delta}}^{N_b} 1, \text{ for } \delta \in (-\infty; +\infty) \tag{4.4.24}$$

The difference $\Delta_{1-2}^{p,g_r,s} - \delta_{1-2,tr,cw}^{p,g_r,s} = \Delta_{1-2}^{p,g_r,s} - 0 = \Delta_{1-2}^{p,g_r,s}$ is $root_{cv}$. The main assumption of the Bootstrap method is that the distribution of $root_{cv}$ in the computer world is the same as the distribution of *root* in the true world. Let us introduce lower and upper auxiliary bounds for the real statistic "difference between two relative frequencies" for $Z=g_r$:

$$\delta_{1-2,re}^{p,g_r,u} = max\left\{ \delta_{1-2,re}^{p,g_r}, -\delta_{1-2,re}^{p,g_r} \right\} \tag{4.4.25}$$

$$\delta_{1-2,re}^{p,g_r,d} = min\left\{ \delta_{1-2,re}^{p,g_r}, -\delta_{1-2,re}^{p,g_r} \right\} \tag{4.4.26}$$

For the one-tail test, either one holds:

$$p_{value,1}^{1T,g_r} = \frac{1}{N_b} \sum_{\substack{q=1 \\ \delta_{1-2,q}^{p,g_r,s} \geq \delta_{1-2,re}^{p,g_r,u}}}^{N_b} 1 \tag{4.4.27}$$

$$p_{value,2}^{1T,g_r} = \frac{1}{N_b} \sum_{\substack{q=1 \\ \delta_{1-2,q}^{p,g_r,s} \leq \delta_{1-2,re}^{p,g_r,d}}}^{N_b} 1 \tag{4.4.28}$$

In the two-tail test

$$p_{value}^{2T,g_r} = 1 - \frac{1}{N_b} \sum_{\substack{q=1 \\ \delta_{1-2,re}^{p,g_r,d} < \delta_{1-2,q}^{p,g_r,s} < \delta_{1-2,re}^{p,g_r,u}}}^{N_b} 1 \tag{4.4.29}$$

All test statistics of the tests may be calculated in one and the same pseudo reality. It follows that in a single pseudo-reality we are able to calculate the p_{value} of the Bootstrap Pearson test for identity of the population discrete distributions, as well as the values p_{value}^{2T,g_r}, $p_{value,1}^{1T,g_r}$ and $p_{value,2}^{1T,g_r}$ of the two-tail, first one-tail and second one-tail tests for identity of the population distributions to belong to discrete g_r for each r=1, 2, …, t. The detailed analysis is given in section 5.3.

Chapter 5 Data Analysis and Findings

The focus of this thesis is "*are there identifiable leadership capabilities needed for the effective leadership of universities?".* To this end a set of verified universal leadership capabilities was used to construct a sixteen-question survey (Appendix 1). The sixty-six participants of the survey were asked a) demographic questions and then b) asked to indicate their view of the importance of each capability and c) asked to rate their assessment the actual level of development of each capability in their university using a 1-5 Likert scale in both cases. Thus, the responses for each capability can be calculated for the whole population as well as for the following pairs of demographics:

a. Male/Female
b. South African/Australian
c. Academic/Professional staff

The data will be presented in the following formats:

1. A summary table of the means of responses for each capability by 'Importance' and 'Development'.
2. Graphical comparisons between 'Importance' and 'Development'
3. Graphical rankings for the whole population
4. Graphical rankings by demographic for the importance of the capabilities
5. Graphical rankings by demographic for the development of the capabilities
6. Rankings by the four domains
7. Bootstrap comparison of responses between demographic within 'Importance'
8. Bootstrap comparison of responses between demographic within 'Development'

5.1 Summary Table

The mean value for the results for each question was calculated for each demographic and are submitted in the table 5-1 below:

Table 5-1: Summary of Survey Results

Question	LEADERSHIP SURVEY RESULTS - MEANS		Whole Population		Men		Women		Australian		South African		Academic		Professional	
			Importance	Development	Importance	Development	Importance	Development	Importance	Development	Importance	Development	Importance	Development	Importance	Development
	LEADERSHIP CAPABILITIES: SELF MASTERY															
1	Develops Self	1	4.6	2.8	4.6	2.9	4.6	2.7	4.6	2.8	4.7	2.8	4.6	2.9	4.6	2.8
2	Communicates with clarity:	2	4.9	2.9	4.9	2.9	4.9	2.8	4.9	2.9	4.9	2.8	4.9	2.9	4.9	2.8
3	Acts in a professional and ethical manner:	3	4.7	3.1	4.7	3.0	4.8	3.4	4.7	3.1	4.8	3.2	4.7	3.2	4.8	3.1
4	Displays personal resilience:	4	4.5	2.9	4.4	3.0	4.7	2.7	4.5	2.9	4.2	2.8	4.5	2.9	4.5	2.9
	LEADERSHIP CAPABILITIES: INTERPERSONAL MASTERY															
5	Connects with stakeholders and builds collaborative relationships:	5	4.7	3.0	4.6	2.9	4.9	3.2	4.7	3.1	4.6	2.6	4.7	2.9	4.6	3.2
6	Leads and empowers others:	6	4.8	2.4	4.7	2.5	4.8	2.4	4.8	2.5	4.7	2.1	4.7	2.5	4.8	2.4
7	Displays emotional judgement:	7	4.5	2.7	4.5	2.8	4.5	2.6	4.5	2.9	4.6	1.9	4.5	2.7	4.5	2.7
8	Embraces individual and cultural differences:	8	4.6	3.3	4.5	3.3	4.7	3.4	4.5	3.3	4.9	3.2	4.6	3.2	4.6	3.7
	LEADERSHIP CAPABILITIES: PROCESS MASTERY															
9	Builds positive conditions for learning:	9	4.6	3.1	4.5	3.0	4.3	2.9	4.4	3.0	4.7	2.8	4.4	2.9	4.5	3.2
10	Plans and coordinates quality curriculum, learning and teaching:	10	4.7	3.1	4.6	3.0	4.8	3.2	4.6	3.2	4.7	2.6	4.6	3.0	4.8	3.2
11	Instils a focus on priority actions and educational outcomes:	11	4.5	3.0	4.4	2.9	4.8	3.3	4.5	3.1	4.4	2.6	4.5	3.0	4.6	3.1
12	Leads change:	12	4.4	2.5	4.3	2.4	4.6	2.8	4.5	2.5	4.1	2.7	4.5	2.4	4.4	2.9
	LEADERSHIP CAPABILITIES: SYSTEMS MASTERY															
13	Develops a shared moral purpose and vision:	13	4.3	2.8	4.2	2.6	4.4	3.2	4.2	2.9	4.6	2.3	4.3	2.6	4.3	3.3
14	Fosters a learning culture:	14	4.5	2.9	4.5	2.9	4.7	3.1	4.5	3.0	4.7	2.6	4.5	2.9	4.5	3.1
15	Thinks and acts strategically:	15	4.5	2.8	4.5	2.6	4.4	3.2	4.4	2.8	4.7	2.9	4.5	2.7	4.4	3.1
16	Fosters innovation and creativity:	16	4.6	2.6	4.5	2.6	4.7	2.5	4.6	2.6	4.4	2.1	4.6	2.5	4.5	2.8
		Mean	4.6	2.9	4.5	2.8	4.7	3.0	4.6	2.9	4.6	2.6	4.6	2.8	4.6	3.0
		Standard Deviation	0.1	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.4	0.1	0.2	0.2	0.3
		Coefficient of variation	3%	8%	3%	8%	4%	11%	3%	8%	5%	14%	3%	9%	4%	10%

Table 5-2: Key to range of responses in Table 5-1

Importance	Colour Code	Likert Range	Whole Pop.Count
Not at all important		1-2	
Mostly unimportant		2-3	
Moderately important		3-4	
Important		4-5	16
Very important		5+	
Total			16

An inspection of the above data shows that all the responses for the importance of the capabilities lay in the "Important" 4-5 range with a mean of 4.6 and a standard deviation of 0.1.

Table 5-3: Range of Likert Responses

Development	Colour Code	Likert Range	Whole Pop.Count
Completely disagree		1-2	
Disagree		2-3	10
Mildly agree		3-4	6
Agree		4-5	
Strongly agree		5+	
Total			16

An inspection of the whole population data shows that ten (10) or 63% of the responses for the development of the capabilities lay in the "Disagree" 2-3 range and six (6) 37% lay in the "Mildly Agree" 3-4 range with an overall mean of 2.9 and a standard deviation of 0.2. The respective coefficients of variation 3% (Importance) to 8% (Development) reflect the comparative spread of the results confirmed the above observations with the Development findings having a factor of 2.7 times the spread in perceived outcomes and arguably underlining the work needed to be done to confirm and develop leadership capabilities. The variances between the responses for the demographic pairs will be examined under the results from the bootstrap simulation.

The data presented in Appendix 3 shows that, in all cases, the state of development fails to approach the perceived level of importance of all capabilities across all demographics. The results for the whole population were then ranked to show the capabilities according to:

a Relative Importance – figure 5-1.

b Relative level of Development – figure 5-2.

c The size of the variance between the importance and level of development for each capability figure 5.3.

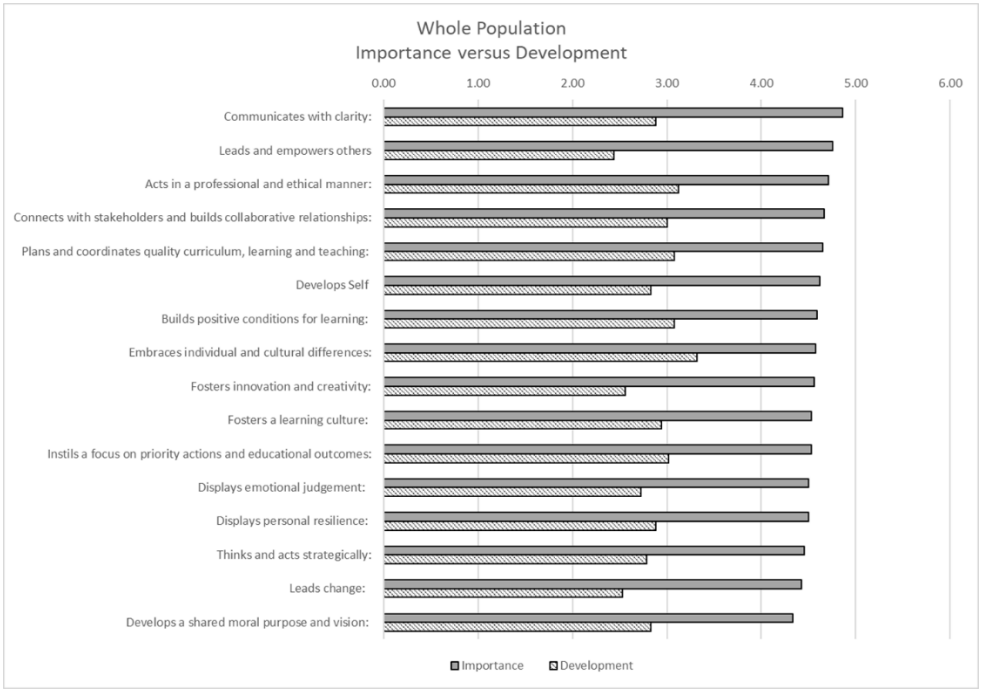

Figure 5-1 Capabilities Ranked by Importance

This illustration of the ranking of importance allow a comparative evaluation of the variance between the capabilities. The results present a range of perceived importance from 4.9 for 'Communicates with clarity' down to 4.3 for 'Develops a shared moral purpose and vision'. However, with a coefficient of variance of 3% and a standard deviation of 0.1 it could be argued that all capabilities were held to be important.

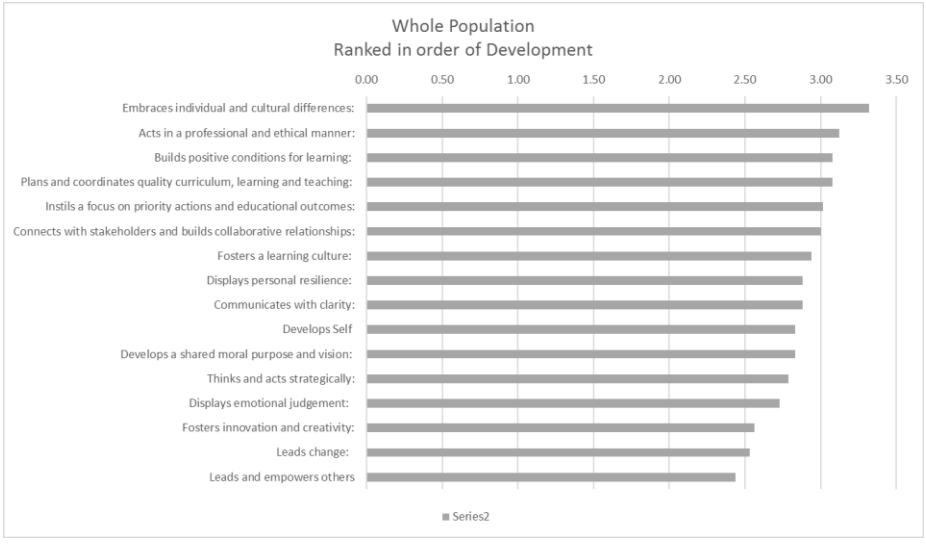

Figure 5-2 Capabilities Ranked by Development

The ranking by the level of development shows a much greater difference in the capabilities as compared to the differences in the results for the importance of the capabilities. Development was considered most developed for 'Embraces individual and cultural differences' (3.3) and lest developed for 'Leads and empowers others' (2.5). The coefficient of variance of 8% confirms the far great spread of levels of development and it would be of interest that leading and empowering others would be considered to be the least developed.

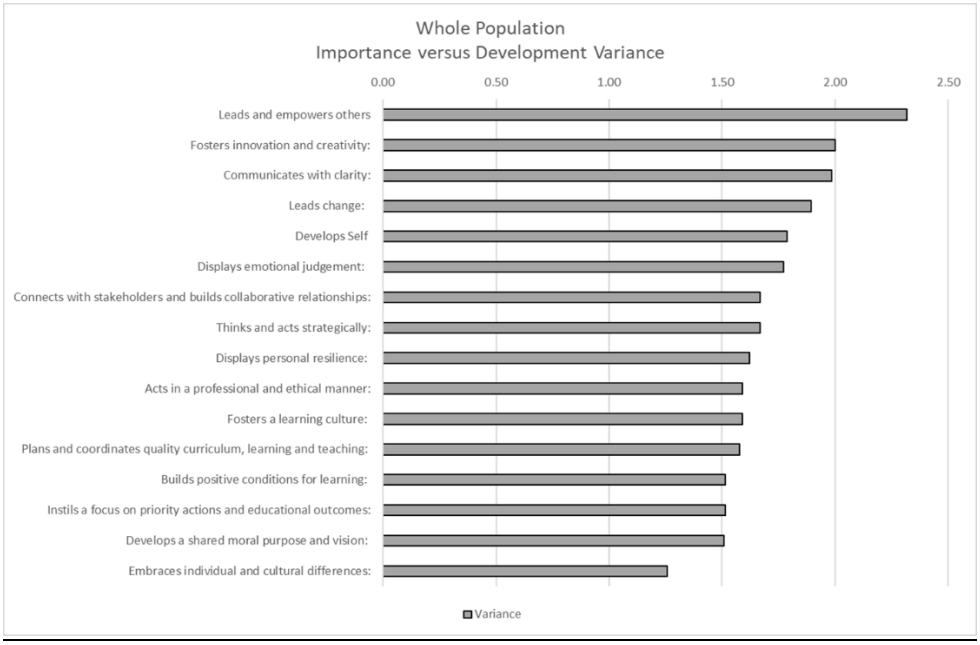

Figure 5-3 Ranked by Variance between Importance and Development

The ranking of the variances confirms that such capabilities as *"Leads and empowers others"* are considered to be very underdeveloped and reflects the result for the ranking by development. Naturally the variances between each pair of demographics would be the result of further qualitative analysis however the results for each demographic pair were examined using quantitative analysis using Bootstrap methods.

Table 5-4 shows more emphatically that leadership and empowerment is the least well developed.

Graphical rankings by demographic for the importance of the capabilities

The graphical data is included for completeness in Appendix 3 however the statistical analysis will be based on the bootstrap analysis.

Table 5-4: Ranking of variances – by capability

CAPABILITIES	Rank Variance
Embraces individual and cultural differences:	1
Develops a shared moral purpose and vision:	2
Instils a focus on priority actions and educational outcomes:	3
Builds positive conditions for learning:	4
Plans and coordinates quality curriculum, learning and teaching:	5
Acts in a professional and ethical manner:	6
Fosters a learning culture:	7
Displays personal resilience:	8
Thinks and acts strategically:	9
Connects with stakeholders and builds collaborative relationships:	10
Displays emotional judgement:	11
Develops Self	12
Leads change:	13
Communicates with clarity:	14
Fosters innovation and creativity:	15
Leads and empowers others	16

Graphical rankings by demographic for the development of the capabilities

The graphical data is included for completeness in Appendix 4

If the data for the four domains is averaged, then we obtain Table 5-5 for the importance of the capabilities. This suggests that the four domains are considered nearly equally important with a variance of +/- 0.1.

If the data for the four domains is averaged, then we obtain Table 5-6 for the development of the capabilities. This demonstrates a nearly equal set of values for level of development and shows all levels of leadership activity require more development.

If the data for the four domains is averaged, then we obtain Table 5-7 for the variance between importance and development of the capabilities. This analysis suggests that the interpersonal skills require the most focus however given that the difference between the results is again +/- 0.1 or 6% this would be considered not significant.

Table 5-5: Ranking of domains- Importance

DIMENSION	Importance	Rank
LEADERSHIP CAPABILITIES: SELF MASTERY	4.7	1
LEADERSHIP CAPABILITIES: INTERPERSONAL MASTERY	4.6	2
LEADERSHIP CAPABILITIES: PROCESS MASTERY	4.5	=3
LEADERSHIP CAPABILITIES: SYSTEMS MASTERY	4.5	=3

Table 5-6: Ranking of domains - Development

DIMENSION	Development	Rank
LEADERSHIP CAPABILITIES: SELF MASTERY	2.9	=1
LEADERSHIP CAPABILITIES: INTERPERSONAL MASTERY	2.9	=1
LEADERSHIP CAPABILITIES: PROCESS MASTERY	2.9	=1
LEADERSHIP CAPABILITIES: SYSTEMS MASTERY	2.8	2

Table 5-7: Ranking of domains – Variance

DIMENSION	Variance	Rank
LEADERSHIP CAPABILITIES: SELF MASTERY	1.7	=2
LEADERSHIP CAPABILITIES: INTERPERSONAL MASTERY	1.8	3
LEADERSHIP CAPABILITIES: PROCESS MASTERY	1.6	1
LEADERSHIP CAPABILITIES: SYSTEMS MASTERY	1.7	=2

5.2 Simulation results

The original raw data was subject to Bootstrap testing (see section 4.4). All tests were completed in MATLAB (MathWorks, 2019). Bootstrap was used to test the null hypothesis H_0 that all responses agreed across all capabilities. Therefore, results with a p_{value} of <0.05 i.e. 5% showed that the null hypothesis did not hold and that there was a statistically significant disagreement between the demographic pairs. An example of the raw MATLAB output is shown in Appendix 6. In practise the actual output was about 800 pages of text and data which was further analysed and summarized. This data was represented in a summarised format in Appendix 6 which highlighted occurrences where pairs of demographic factors (e.g. academic and professional) expressed a statistically significant variance in opinion. For example, the examination of the importance of self-development yielded the following results:

Table 5-8: Example of Processed Bootstrap Results

Question: IO Selfdevelopment, code=5, discretes=5						
Question: IO Strategy, code=33, discretes=5						
		Position		Position	Academics	Professional
				# of observations	40	25
Pearson	1	0.0466		Relative Frequency		
Not at all important	2a			of the Discrete 'Mostly Unimportant'	0.0000	0.1200
Not at all important	2b			Relative Frequency		
Mostly unimportant	3a	0.0378		of the Discrete 'Moderetely Important'	0.0750	0.0400
Mostly unimportant	3b	0.0266		Relative Frequency		
Moderately important	4a	0.5845		of the Discrete 'Important'	0.9250	0.8400
Moderately important	4b	0.3288				
Important	5a	0.268				
Important	5b	0.1473				

The application of Bootstrap allows a statistical analysis of responses between the different demographics within each domain i.e. 'Importance' and 'Development'. The following needs to be noted:

1. The references to code refer to the unique designation given to each capability for the purposes of bootstrap analysis. It has no other purpose.
2. The term discrete five (5) indicates all response levels were considered separately.
3. The term discrete three (3) indicates that the responses one and two and four and five were combined i.e. the five possible responses were consolidated into three.

The data output by MATLAB was the p-value of the conducted statistical tests. A significance level of 0.05 is adopted. If the p-value is less than 0.05, we reject the null hypothesis that there's no difference between the means and conclude that a significant difference does exist (Rice, 1989; Wasserstein & Lazar, 2016). Given the density of the information the Bootstrap data was summarised into three tables (Tables 5-11, 5-12, 5-13) indicating where there was statistically significant disagreement between responses or where further investigation would be required.

5.2.1. Impact of gender

We shall analyse the impact of gender. Of all respondents, 44 were male and 19 were female.

LEADERSHIP CAPABILITIES: SELF MASTERY

Self-Development

A Pearson test for equality of the populations discrete distributions is conducted with p_{value}= 1.721 indicating that there is no statistically significant difference of population of responses across males and females. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 9% males agreed that communication was moderately important compared to 0% of females, which is not statistically significance (p_{value}=0.193). A total of 91% males agreed that there was a focus on communication was important compared to 100% of females, which is statistically not significant (p_{value}=0.1014).

Communicates with clarity

A Pearson test for equality of the populations discrete distributions is conducted with p_{value}= 0.415 indicating that there is no statistically significant difference of population of responses across males and females. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 2% males agreed that communication was moderately important compared to 0% of females, which is not statistically significance (p_{value}=0.5981). A total of 91% males agreed that there was a focus on communication was important compared to 100% of females, which is statistically insignificant (p_{value}=0.3818).

Acts in a professional and ethical manner

A Pearson test for equality of the populations discrete distributions is conducted with p_{value}= 0.8717 indicating that there is no statistically significant difference of population of responses across males and females. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 4% males thought that acting in a professional and ethical manner was mostly unimportant compared to 0% of females, which is not statistically significance (p_{value}=0.405). A total of 96% males thought that acting in a professional and ethical manner was important compared to 100% of females, which is statistically insignificant (p_{value}=0.2267).

Displays personal resilience

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} =0.04224 indicating that there is no statistically significant difference of population of responses across males and females. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 4% males thought that this capability was moderately important compared to 6% of females, which is not statistically significance (p_{value}=0.8731). A total of 96% males thought that this capability was important compared to 94% of females, which is statistically insignificant (p_{value}=0.4279).

LEADERSHIP CAPABILITIES: INTERPERSONAL MASTERY

Connects with stakeholders and builds collaborative relationships

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} = 0.8523 indicating that there is no statistically significant difference of population of responses across males and females. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 4% males thought that this capability was moderately important compared to 0% of females, which is not statistically significance (p_{value}= 0.404). A total of 96 % males thought that this capability was important compared to 100 % of females, which is statistically insignificant (p_{value}=0.2311).

Leads and empowers others

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} = 0.4195 indicating that there is no statistically significant difference of population of responses across males and females. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 2% males thought that this capability was moderately important compared to 0% of females, which is not statistically significance (p_{value}= 0.6000). A total of 98% males thought that this capability was important compared to 100% of females, which is statistically insignificant (p_{value}=0.381).

Displays emotional judgement

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} == 0.2559 indicating that there is no statistically significant difference of population of responses across males and females. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 4 % males thought that this capability was moderately important compared to 5% of females, which is not statistically significance (p_{value}= 0.9483). A total of 96% males thought that this capability was important compared to 95% of females, which is statistically insignificant (p_{value}= 0.4449).

Embraces individual and cultural differences

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} = 0.6656 indicating that there is no statistically significant difference of population of responses across males and females. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 2% males thought that this capability was mostly unimportant compared to 0% of females, which is not statistically significance (p_{value}= 0.5982). A total of 9 % males thought that this capability was moderately important compared to 5% of females, which is statistically insignificant (p_{value}=0.3824). A total of 89 % males thought that this capability was important compared to 95% of females, which is statistically insignificant (p_{value}=0.2826).

LEADERSHIP CAPABILITIES: PROCESS MASTERY

Builds positive conditions for learning

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} = 0.4887 indicating that there is no statistically significant difference of population of responses across males and females. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 2% males thought that this capability was moderately important compared to 6% of females, which is not statistically significance (p_{value}=0.5328). A total of 98% males thought that this capability was important compared to 94% of females, which is statistically insignificant (p_{value}=0.2942).

Plans and coordinates quality curriculum, learning and teaching

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} = 1.205 indicating that there is no statistically significant difference of population of responses across males and females. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 6% males thought that this capability was moderately important compared to 0% of females, which is not statistically significance (p_{value}=0.3119). A total of 94% males thought that this capability was important compared to 100% of females, which is statistically insignificant (p_{value}= 0.1772).

Instils a focus on priority actions and educational outcomes

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} = 0.2231 indicating that there is no statistically significant difference of population of responses across males and females. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 9% males thought that this capability was moderately important compared to 5% of females, which is statistically insignificant (p_{value}=0.6711). A total of 91% males thought that this capability was important compared to 95% of females, which is statistically insignificant (p_{value}=0.3687).

Leads change

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} = 1.732 indicating that there is no statistically significant difference of population of responses across males and females. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 9% males thought that this capability was mostly unimportant compared to 0% of females, which is not statistically significance (p_{value}=0.1942). A total of 4% males thought that this capability was moderately important compared to 5% of females, which is statistically insignificant (p_{value}=0.4501). A total of 87% males thought that this capability was important compared to 95% of females, which is statistically insignificant (p_{value}=0.2047).

LEADERSHIP CAPABILITIES: SYSTEMS MASTERY

Develops a shared moral purpose and vision

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} =4.072 indicating that there is no statistically significant difference of population of responses across males and females. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 2% males thought that this capability was mostly unimportant compared to 10% of females, which is statistically insignificant (p_{value}=0.1825). A total of 11% males thought that this capability was moderately important compared to 0% of females, which is statistically insignificant (p_{value}=0.611). A total of 87% males thought that this capability was important compared to 90% of females, which is statistically insignificant (p_{value}=0.4055).

Fosters a learning culture

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} = 0.4477 indicating that there is no statistically significant difference of population of responses across males and females. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 2% males thought that this capability was mostly unimportant compared to 0% of females, which is statistically insignificant (p_{value}=0.6022). A total of 6% males thought that this capability was moderately important compared to 5% of females, which is statistically insignificant (p_{value}=0.512). A total of 92% males thought that this capability was important compared to 94% of females, which is statistically insignificant (p_{value}=0.385).

Thinks and acts strategically

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} =1.768 indicating that there is no statistically significant difference of population of responses across males and females. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 4% males thought that this capability was mostly unimportant compared to 5% of females, which is statistically insignificant (p_{value}=0.4507). A total of 9% males thought that this capability was moderately important compared to 0% of females, which is statistically insignificant (p_{value}=0.1022). A total of 87% males thought that this capability was important compared to 95% of females, which is statistically insignificant (p_{value}=0.1978).

Fosters innovation and creativity

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} =0.4527 indicating that there is no statistically significant difference of population of responses across males and females. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 2% males thought that this capability was moderately important compared to 5% of females, which is statistically insignificant (p_{value}=0.5515). A total of 98% males thought that this capability was important compared to 95% of females, which is statistically insignificant (p_{value}=0.3043).

5.2.2. Impact of country

We explore the influence of nationality (country of origin). Of all respondents, 9 were South Africans and 57 were Australians.

LEADERSHIP CAPABILITIES: SELF MASTERY

Self-Development

A Pearson test for equality of the populations discrete distributions is conducted with p_{value}=0.6723 indicating that there is no statistically significant difference of population of responses across South Africans and Australians. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 0% South Africans agreed that communication was moderately important compared to 7% of Australians, which is not statistically significance (p_{value}=0.471). A total of 100% South Africans agreed that there was a focus on communication was important compared to 93% of Australians, which is statistically not significant (p_{value}=0.2644).

Communicates with clarity

A Pearson test for equality of the populations discrete distributions is conducted with p_{value}=0.1603 indicating that there is no statistically significant difference of population of responses across South Africans and Australians. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 0% South Africans agreed that communication was moderately important compared to 2% of Australians, which is not statistically significance (p_{value}=0.6363). A total of 100% South Africans agreed that there was a focus on communication was important compared to 98% of Australians, which is statistically insignificant (p_{value}=0.5063).

Acts in a professional and ethical manner

A Pearson test for equality of the populations discrete distributions is conducted with p_{value}=0.8717 indicating that there is no statistically significant difference of population of responses across South Africans and Australians. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 4% South Africans thought that acting in a professional and ethical manner was mostly unimportant compared to 0% of Australians, which is not statistically significance (p_{value}=0.405). A

total of 96% South Africans thought that acting in a professional and ethical manner was important compared to 100% of Australians, which is statistically insignificant (p_{value}=0.2267).

Displays personal resilience

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} =0.9672 indicating that there is no statistically significant difference of population of responses across South Africans and Australians. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 11% South Africans thought that this capability was moderately important compared to 4% of Australians, which is not statistically significance (p_{value}=0.2916). A total of 89% South Africans thought that this capability was important compared to 96% of Australians, which is statistically insignificant (p_{value}=0.2152).

LEADERSHIP CAPABILITIES: INTERPERSONAL MASTERY

Connects with stakeholders and builds collaborative relationships

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} =0.3316 indicating that there is no statistically significant difference of population of responses across South Africans and Australians. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 0% South Africans thought that this capability was moderately important compared to 4% of Australians, which is not statistically significance (p_{value}=0.6235). A total of 100% South Africans thought that this capability was important compared to 96% of Australians, which is statistically insignificant (p_{value}=0.3958).

Leads and empowers others

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} =0.1632 indicating that there is no statistically significant difference of population of responses across South Africans and Australians. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 0% South Africans thought that this capability was moderately important compared to 2% of Australians, which is not statistically significance (p_{value}=0.6266). A total of 100% South Africans thought that this capability was important compared to 98% of Australians, which is statistically insignificant (p_{value}=0.495).

Displays emotional judgement

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} =0.5055 indicating that there is no statistically significant difference of population of responses across South Africans and Australians. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 0% South Africans thought that this capability was moderately important compared to 5% of Australians, which is not statistically significance (p_{value}= 0.5885). A total of 100% South Africans thought that this capability was important compared to 95% of Australians, which is statistically insignificant (p_{value}=0.3133).

Embraces individual and cultural differences

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} =1.062 indicating that there is no statistically significant difference of population of responses across South Africans and Australians. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 0% South Africans thought that this capability was mostly unimportant compared to 1% of Australians, which is not statistically significance (p_{value}= 0.6411). A total of 0% South Africans thought that this capability was moderately important compared to 9% of Australians, which is statistically insignificant (p_{value}=*0.2089*). A total of 100% South Africans thought that this capability was important compared to 90% of Australians, which is statistically insignificant (p_{value}= 0.1752).

LEADERSHIP CAPABILITIES: PROCESS MASTERY

Builds positive conditions for learning

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} = 0.8542 indicating that there is no statistically significant difference of population of responses across South Africans and Australians. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 0% South Africans thought that this capability was moderately unimportant compared to 2% of Australians, which is not statistically significance (p_{value}=0.644). A total of 0% South Africans thought that this capability was moderately important compared to 7% of Australians, which is statistically insignificant (p_{value}=0.2623). A total of 100% South Africans thought that this capability was important compared to 91% of Australians, which is statistically insignificant (p_{value}=0.2416).

Plans and coordinates quality curriculum, learning and teaching

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} =0.5055 indicating that there is no statistically significant difference of population of responses across South Africans and Australians. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 0% South Africans thought that this capability was moderately important compared to 5% of Australians, which is not statistically significance (p_{value}=0.5815). A total of 100% South Africans thought that this capability was important compared to 95% of Australians, which is statistically insignificant (p_{value}=0.3180).

Instils a focus on priority actions and educational outcomes

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} =0.8705 indicating that there is no statistically significant difference of population of responses across South Africans and Australians. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 0% South Africans thought that this capability was moderately important compared to 9% of Australians, which is statistically insignificant (p_{value}=0.3792). A total of 100% South Africans thought that this capability was important compared to 91% of Australians, which is statistically insignificant (p_{value}=0.2173).

Leads change

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} = 1.584 indicating that there is no statistically significant difference of population of responses across South Africans and Australians. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 11% South Africans thought that this capability was mostly unimportant compared to 5% of Australians, which is not statistically significance (p_{value}=0.545). A total of 11% South Africans thought that this capability was moderately important compared to 4% of Australians, which is statistically insignificant (p_{value}=0.272). A total of 78% South Africans thought that this capability was important compared to 91% of Australians, which is statistically insignificant (p_{value}=0.1349).

LEADERSHIP CAPABILITIES: SYSTEMS MASTERY

Develops a shared moral purpose and vision

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} =1.527 indicating that there is no statistically significant difference of population of responses across South Africans and Australians. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 0% South Africans thought that this capability was mostly unimportant compared to 6% of Australians, which is statistically insignificant (p_{value}=0.5814). A total of 0% South Africans thought that this capability was moderately important compared to 9% of Australians, which is statistically insignificant (p_{value}=0.2077). A total of 100% South Africans thought that this capability was important compared to 85% of Australians, which is statistically insignificant (p_{value}=.1157).

Fosters a learning culture

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} = 0.8542 indicating that there is no statistically significant difference of population of responses across South Africans and Australians. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 0% South Africans thought that this capability was mostly unimportant compared to 2% of Australians, which is statistically insignificant (p_{value}=0.6440). A total of 0% South Africans thought that this capability was moderately important compared to 7% of Australians, which is statistically insignificant (p_{value}=0.2623). A total of 100% South Africans thought that this capability was important compared to 91% of Australians, which is statistically insignificant (p_{value}=0.2146).

Thinks and acts strategically

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} =1.101 indicating that there is no statistically significant difference of population of responses across South Africans and Australians. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 0% South Africans thought that this capability was mostly unimportant compared to 5% of Australians, which is statistically insignificant (p_{value}=0.6228). A total of 0% South Africans thought that this capability was moderately important compared to 7% of Australians, which is statistically

insignificant (p_{value}=0.2794). A total of 100% South Africans thought that this capability was important compared to 88% of Australians, which is statistically insignificant (p_{value}=0.1780).

Fosters innovation and creativity

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} =0.3257 indicating that there is no statistically significant difference of population of responses across South Africans and Australians. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 0% South Africans thought that this capability was moderately important compared to 4% of Australians, which is statistically insignificant (p_{value}=0.621). A total of 100% South Africans thought that this capability was important compared to 96% of Australians, which is statistically insignificant (p_{value}=0.3872).

5.2.3. Impact of Professional Capacity

We explore the impact of professional role. Of all respondents, 41 were academics and 25 were professionals

LEADERSHIP CAPABILITIES: SELF MASTERY

Self-Development

A Pearson test for equality of the populations discrete distributions is conducted with p_{value}= 0.2659 indicating that there is no statistically significant difference of population of responses across academics and professionals. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 5% academics agreed that communication was moderately important compared to 8% of professionals, which is not statistically significance (p_{value}=0.6637). A total of 95% academics agreed that there was a focus on communication was important compared to 92% of professionals, which is statistically not significant (p_{value}=0.3325).

Communicates with clarity

A Pearson test for equality of the populations discrete distributions is conducted with p_{value}=0.6191 indicating that there is no statistically significant difference of population of responses across academics and professionals. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 2% academics agreed that communication was moderately important compared to 0% of professionals, which is not statistically significance (p_{value}=0.5156). A total of 98% academics agreed that there was a focus on communication was important compared to 100% of professionals, which is statistically insignificant (p_{value}=0.3238).

Acts in a professional and ethical manner

A Pearson test for equality of the populations discrete distributions is conducted with p_{value}=1.239 indicating that there is no statistically significant difference of population of responses across academics and professionals. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 5% academics thought that acting in a professional and ethical manner was mostly unimportant compared to 0% of professionals, which is not statistically significance (p_{value}=0.3004). A total of 95% academics thought that acting in a professional and ethical manner was important compared to 100% of professionals, which is statistically insignificant (p_{value}=0.1763).

Displays personal resilience

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} =1.766 indicating that there is no statistically significant difference of population of responses across academics and professionals. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 7% academics thought that this capability was moderately important compared to 0% of professionals, which is not statistically significance (p_{value}=0.216). A total of 93% academics thought that this capability was important compared to 100% of professionals, which is statistically insignificant (p_{value}=0.1198).

LEADERSHIP CAPABILITIES: INTERPERSONAL MASTERY

Connects with stakeholders and builds collaborative relationships

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} = 3.302 indicating that there is no statistically significant difference of population of responses across academics and professionals. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 0% academics thought that this capability was moderately important compared to 8% of professionals, which is not statistically significance (p_{value}=0.882). A total of 100% academics thought

that this capability was important compared to 92% of professionals, which is statistically insignificant (p_{value}=0.0706).

Leads and empowers others

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} =0.5945 indicating that there is no statistically significant difference of population of responses across academics and professionals. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 2% academics thought that this capability was moderately important compared to 0% of professionals, which is not statistically significance (p_{value}=0.5255). A total of 98% academics thought that this capability was important compared to 100% of professionals, which is statistically insignificant (p_{value}=0.3348).

Displays emotional judgement

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} =1.966 indicating that there is no statistically significant difference of population of responses across academics and professionals. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 8% academics thought that this capability was moderately important compared to 0% of professionals, which is not statistically significance (p_{value}=0.1913). A total of 92% academics thought that this capability was important compared to 100% of professionals, which is statistically insignificant (p_{value}=0.992).

Embraces individual and cultural differences

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} = 2.327 indicating that there is no statistically significant difference of population of responses across academics and professionals. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 0% academics thought that this capability was mostly unimportant compared to 4% of professionals, which is not statistically significance (p_{value}=0.2686). A total of 10 % academics thought that this capability was moderately important compared to 4% of professionals, which is statistically insignificant (p_{value}=0.2378). A total of 90% academics thought that this capability was important compared to 92% of professionals, which is statistically insignificant (p_{value}=0.4729).

LEADERSHIP CAPABILITIES: PROCESS MASTERY

Builds positive conditions for learning

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} =0.1038 indicating that there is no statistically significant difference of population of responses across academics and professionals. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 3% academics thought that this capability was moderately important compared to 4% of professionals, which is not statistically significance (p_{value}=0.7753). A total of 97% academics thought that this capability was important compared to 96% of professionals, which is statistically insignificant (p_{value}=0.4007).

Plans and coordinates quality curriculum, learning and teaching

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} = 0.0174 indicating that there might be statistically significant difference of population of responses across academics and professionals. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 5% academics thought that this capability was moderately important compared to 4% of professionals, which is not statistically significance (p_{value}=0.9537). A total of 95% academics thought that this capability was important compared to 96% of professionals, which is statistically insignificant (p_{value}=0.517).

Instils a focus on priority actions and educational outcomes

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} =0.2231 indicating that there is no statistically significant difference of population of responses across academics and professionals. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 9% academics thought that this capability was moderately important compared to 5% of professionals, which is statistically insignificant (p_{value}=0.6809). A total of 91% academics thought that this capability was important compared to 95% of professionals, which is statistically insignificant (p_{value}=0.3708).

Leads change

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} = 0.2848 indicating that there is no statistically significant difference of population of responses across academics and professionals. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 5% academics thought that this capability was mostly unimportant compared to 8% of professionals, which is not statistically significance (p_{value}=0.6558). A total of 5% academics thought that this capability was moderately important compared to 4% of professionals, which is statistically insignificant (p_{value}=0.4872). A total of 90% academics thought that this capability was important compared to 88% of professionals, which is statistically insignificant (p_{value}=0.4027).

LEADERSHIP CAPABILITIES: SYSTEMS MASTERY

Develops a shared moral purpose and vision

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} =1.765 indicating that there is no statistically significant difference of population of responses across academics and professionals. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 3% academics thought that this capability was mostly unimportant compared to 9% of professionals, which is statistically insignificant (p_{value}=0.2768). A total of 10% academics thought that this capability was moderately important compared to 4% of professionals, which is statistically insignificant (p_{value}=0.2392). A total of 87% academics thought that this capability was important compared to 87% of professionals, which is statistically insignificant (p_{value}=0.4883).

Fosters a learning culture

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} = 4.135 indicating that there is no statistically significant difference of population of responses across academics and professionals. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 0% academics thought that this capability was mostly unimportant compared to 4% of professionals, which is statistically insignificant (p_{value}=0.2777). A total of 10% academics thought that this capability was moderately important compared to 0% of professionals, which is statistically

insignificant (p_{value}=0.0630). A total of 90% academics thought that this capability was important compared to 96% of professionals, which is statistically insignificant (p_{value}=0.2142).

Thinks and acts strategically

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} = 0.0466 indicating that there is a statistically significant difference of population of responses across academics and professionals. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 0% academics thought that this capability was mostly unimportant compared to 12% of professionals, which is statistically significant (p_{value}=0.0378). A total of 8% academics thought that this capability was moderately important compared to 4% of professionals, which is statistically insignificant (p_{value}=0.3288). A total of 92% academics thought that this capability was important compared to 84% of professionals, which is statistically insignificant (p_{value}=0.1473).

Fosters innovation and creativity

A Pearson test for equality of the populations discrete distributions is conducted with p_{value} =0.0354 indicating that there is borderline statistically significant difference of population of responses across academics and professionals. At a next stage, tests were conducted for equality of population's relative frequencies for each of the possible answer scales.

A total of 0% academics thought that this capability was moderately important compared to 10% of professionals, which is statistically significant (p_{value}=0.0549). A total of 100% academics thought that this capability was important compared to 90% of professionals, which is borderline statistically significant difference of opinion and requires investigation.

Hypothesis testing using Bootstrap simulation revealed compete agreement on the importance of all the capabilities presented. There were only two results which revealed some disagreement.

Leadership Importance - Thinks and acts strategically - code33 (By position)

Table 5-9 : MATLAB Data for Capability – Thinks and acts strategically

Question: IO Strategy, code=33, discretes=5									
		Gender	Country	Capacity	Position		Position	Academics	Professional
							# of observations	40	25
Pearson	1	0.4166	0.5081	0.1353	0.0466		Relative Frequency		
Not at all important	2a						of the Discrete 'Mostly Unimportant'	0.0000	0.1200
Not at all important	2b						Relative Frequency		
Mostly unimportant	3a	0.9488	0.6228	0.191	0.0378		of the Discrete 'Moderetely Important'	0.0750	0.0400
Mostly unimportant	3b	0.4507	0.3496	0.1223	0.0266		Relative Frequency		
Moderately important	4a	0.1933	0.5303	0.1776	0.5845		of the Discrete 'Important'	0.9250	0.8400
Moderately important	4b	0.1022	0.2794	0.0909	0.3288				
Important	5a	0.3771	0.3433	0.9541	0.268				
Important	5b	0.1978	0.178	0.4911	0.1473				

This table 5-9 shows that twelve percent (12%) of professional staff considered that it was not important for leadership to think and act strategically. This view was not shared by academic staff (0%).

Leadership Importance – Fosters innovation and creativity - code 35 (By capacity)

Table 5-10: MATLAB Data for Capability – Fosters innovation and creativity

Question: IO Creativity, code=35, discretes=5

		Gender	Country	Capacity	Position
Pearson	1	0.5285	0.6091	0.0354	0.0525
Not at all important	2a				
Not at all important	2b				
Mostly unimportant	3a				
Mostly unimportant	3b				
Moderately important	4a	0.5515	0.621	0.0549	0.0835
Moderately important	4b	0.3043	0.3872	0.0474	0.0654
Important	5a	0.5515	0.621	0.0549	0.0835
Important	5b	0.3043	0.3872	0.0474	0.0654
Very Important	6a				
Very Important	6b				

Capacity	Sample 1	Sample 2
# of observations	46	20
Relative Frequency		
of the Discrete 'Moderetely Important'	0.0000	0.1000
Relative Frequency		
of the Discrete 'Important'	1.0000	0.9000

Results labelled B1 and B2 in the table 5.2. Note the sample numbers vary because of academic staff holding professional positions. The complete results are given in Appendix 5. This shows that ten percent (10%) of staff acting in a professional capacity considered that it was only moderately important for leadership to foster innovation and creativity. This view was not shared by staff acting in an academic capacity who all agreed that this capability was important as opposed to moderately important. This result was supported by the results for the discrete 3 values.

Bootstrap comparison of responses between demographic within 'Development' – Individual Capabilities

Table 5-11: Summary of MATLAB analysis of the Importance of Capabilities

Question	LEADERSHIP SURVEY RESULTS - BOOTSTRAP SUMMARY IMPORTANCE	Whole Population	Men	Women	Australian	South African	Academic	Professional
		Importance	Importance	Importance	Importance	Importance	Importance	Importance
	LEADERSHIP CAPABILITIES: SELF MASTERY							
1	Develops Self	✓	✓	✓	✓	✓	✓	✓
2	Communicates with clarity	✓	✓	✓	✓	✓	✓	✓
3	Acts in a professional and ethical manner	✓	✓	✓	✓	✓	✓	✓
4	Displays personal resilience	✓	✓	✓	✓	✓	✓	✓
	LEADERSHIP CAPABILITIES: INTERPERSONAL MASTERY							
5	Connects with stakeholders and builds collaborative relationships	✓	✓	✓	✓	✓	✓	✓
6	Leads and empowers others	✓	✓	✓	✓	✓	✓	✓
7	Displays emotional judgement	✓	✓	✓	✓	✓	✓	✓
8	Embraces individual and cultural differences	✓	✓	✓	✓	✓	✓	✓
	LEADERSHIP CAPABILITIES: PROCESS MASTERY							
9	Builds positive conditions for learning	✓	✓	✓	✓	✓	✓	✓
10	Plans and coordinates quality curriculum, learning and teaching	✓	✓	✓	✓	✓	✓	✓
11	Instils a focus on priority actions and educational outcomes	✓	✓	✓	✓	✓	✓	✓
12	Leads change	✓	✓	✓	✓	✓	✓	✓
	LEADERSHIP CAPABILITIES: SYSTEMS MASTERY							
13	Develops a shared moral purpose and vision	✓	✓	✓	✓	✓	✓	✓
14	Fosters a learning culture	✓	✓	✓	✓	✓	✓	✓
15	Thinks and acts strategically	✓	✓	✓	✓	✓	A1	A2
16	Fosters innovation and creativity	✓	✓	✓	✓	✓	B1	B2

Key:

Represent statistically significant results

✓ Represents statistically insignificant results

Table 5-12: Summary of MATLAB analysis of the Development of Capabilities

Question	LEADERSHIP SURVEY RESULTS - BOOTSTRAP SUMMARY OF DEVELOPMENT- Single Capabilities	Whole Population	Men	Women	Australian	South African	Academic	Professional
		Development	Development	Development	Development	Development	Development	Development
	LEADERSHIP CAPABILITIES: SELF MASTERY							
1	Develops Self							
2	Communicates with clarity							
3	Acts in a professional and ethical manner		A1	A2				
4	Displays personal resilience							
	LEADERSHIP CAPABILITIES: INTERPERSONAL MASTERY							
5	Connects with stakeholders and builds collaborative relationships				D1	D2		
6	Leads and empowers others							
7	Displays emotional judgement				E1	E2		
8	Embraces individual and cultural differences						B1	B2
	LEADERSHIP CAPABILITIES: PROCESS MASTERY							
9	Builds positive conditions for learning							
10	Plans and coordinates quality curriculum, learning and teaching				F1	F2		
11	Instils a focus on priority actions and educational outcomes						C1	C2
12	Leads change							
	LEADERSHIP CAPABILITIES: SYSTEMS MASTERY							
13	Develops a shared moral purpose and vision		G1	G2				
14	Fosters a learning culture							
15	Thinks and acts strategically							
16	Fosters innovation and creativity		H1	H2				

Key:

Represent statistically significant results

Represent statistically borderline results which may need further investigation

Table 5-13: Summary of MATLAB analysis of the Development of Grouped Capabilities

Question	LEADERSHIP SURVEY RESULTS - BOOTSTRAP SUMMARY OF DEVELOPMENT - Grouped Capabilities		Whole Population	Men	Women	Australian	South African	Academic	Professional
			Development	Development	Development	Development	Development	Development	Development
	LEADERSHIP CAPABILITIES: SELF MASTERY								
1	Develops Self	1							
2	Communicates with clarity	2							
3	Acts in a professional and ethical manner	3							
4	Displays personal resilience	4							
	LEADERSHIP CAPABILITIES: INTERPERSONAL MASTERY								
5	Connects with stakeholders and builds collaborative relationships	5				A1	A2	B1	B2
6	Leads and empowers others	6				A1	A2	B1	B2
7	Displays emotional judgement	7				A1	A2	B1	B2
8	Embraces individual and cultural differences	8				A1	A2	B1	B2
	LEADERSHIP CAPABILITIES: PROCESS MASTERY								
9	Builds positive conditions for learning	9		C1	C2	D1	D2		
10	Plans and coordinates quality curriculum, learning and teaching	10		C1	C2	D1	D2		
11	Instils a focus on priority actions and educational outcomes	11		C1	C2	D1	D2		
12	Leads change	12		C1	C2	D1	D2		
	LEADERSHIP CAPABILITIES: SYSTEMS MASTERY								
13	Develops a shared moral purpose and vision	13		F1	F2	G1	G2	E1	E2
14	Fosters a learning culture	14		F1	F2	G1	G2	E1	E2
15	Thinks and acts strategically	15		F1	F2	G1	G2	E1	E2
16	Fosters innovation and creativity	16		F1	F2	G1	G2	E1	E2

Key:

Represent statistically significant results

Represent statistically borderline results which may need further investigation

Statistically Significant Results

Leadership Development - Acts in a professional and ethical manner A1 and A2: Here 62% of females agreed that the leadership behaved in a professional and ethical matter compared to 32% of males with p values of ~0.03, whereas 34% of men mildly agreed as opposed to 11% of women

Leadership Development - Embraces individual and cultural differences B1 and B2: This result shows that 16% of professional staff strongly agreed that leadership was well developed in terms of embracing individual and cultural differences as opposed to 2% of academic staff.

Leadership Development – Instils a focus on priority actions and educational outcomes C1 and C2: 42% of professional staff disagreed that their leadership focused on priorities and educational outcomes as opposed to 16% of academics.

Chapter 6 Conclusions

6.1 Summary of findings

A constant theme throughout this thesis was the cultural resistance of universities to recognise their need to respond to the changing environment and the fact that this is a leadership responsibility. The implications of this extend beyond the value of this immediate research and suggests further research into achieving change in university cultures.

The thesis aimed to respond to the main research question of *what leadership capabilities are required for effective leadership in universities.* It was possible to show that there were leadership capabilities required by university leadership with two possible exceptions namely a) Thinks and acts strategically and b) Fosters innovation and creativity.

As a result of the statistical analysis, it was possible to show that the uncontested leadership capabilities are:

LEADERSHIP CAPABILITIES SELF MASTERY

Develops Self

Communicates with clarity

Acts in a professional and ethical manner

Displays personal resilience

LEADERSHIP CAPABILITIES INTERPERSONAL MASTERY

Connects with stakeholders and builds collaborative relationships

Leads and empowers others

Displays emotional judgement

Embraces individual and cultural differences

LEADERSHIP CAPABILITIES PROCESS MASTERY

Builds positive conditions for learning

Plans and coordinates quality curriculum, learning and teaching

Instils a focus on priority actions and educational outcomes

Leads change

LEADERSHIP CAPABILITIES SYSTEMS MASTERY

Develops a shared moral purpose and vision

Fosters a learning culture

Thinks and acts strategically

Fosters innovation and creativity

This research demonstrated that there are a set of identifiable leadership capabilities needed for the effective leadership of universities; the confirmation of which was possible using bootstrap statistical analysis. The results and analysis suggested several key refinements to the development and use of capabilities for leadership in universities and hence a valuable area for future research. However, this remains a very much underdeveloped topic and would be better advanced through closer collaboration with other universities and organisations, particularly if wider acceptance needs to be promoted.

The graphical analysis of the results from Appendix 3 reveals many pairs with noticeable variations which was why Bootstrap was used to identify which pairs had statistically significant differences. The survey data and the Bootstrap results confirms that most capabilities were considered to be important with the possible exception of two survey questions, namely question 15 (Thinks and acts strategically) and question 16 (Fosters innovation and creativity). In both cases the capabilities were questioned because of differences of opinion between academic and professional staff. For both questions, it was the professional staff that disagreed that the capabilities were not importance. Therefore, whilst there were statistically significant differences the professional populations in question were Q15 10% and Q16 12% of the total professional staff respectively. This represented three (3) respondents out of a total of sixty-six (66). Further work is required to determine if this level of difference of opinion is sufficient to invalidate the capacities. In line with the work being currently conducted by non-educational organisations the two capabilities given above would be subject to refinement or replacement.

There were a far wider range of opinions on the levels of development. This is critical gap analysis between the desired state and the reality. The descriptive analysis showed that the gap can be visualized as follows:

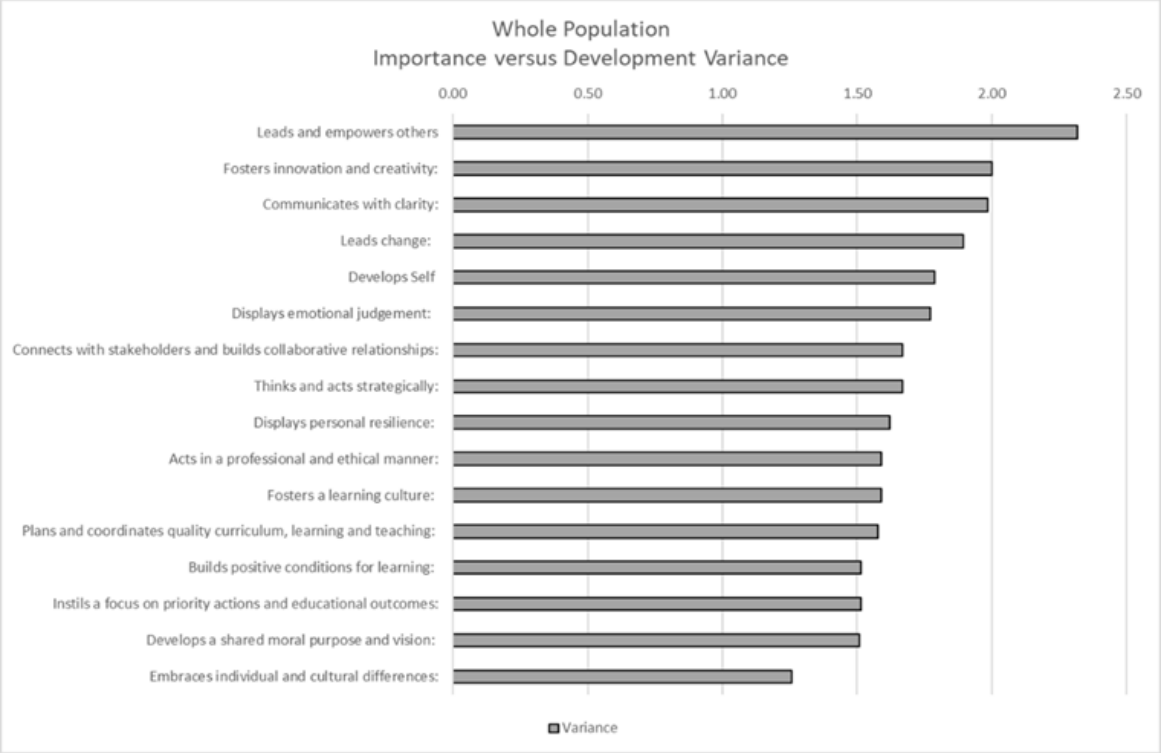

Figure 6. 1: Variance between Importance and Development by Capability

The least developed capability was *'Leads and empowers others'* which suggests that the general absence of research into university leadership capabilities could be the product of leadership being undervalued as evidenced by it being the least developed.

However, this represents work for the future in terms of constructing leadership development courses and will not be discussed further in this thesis.

6.2 Limitations of findings

The limitations of this research reflect the lack of research into university leadership capabilities and the fact that this is a field which is rapidly evolving outside academia which makes reliable data difficult to source. The lack of research into this area means that the theoretical and developmental foundation is very much underdeveloped which is why this thesis had to be both exploratory through the use of a survey and explanatory through comparison with non-academic organisations. It is worth noting that the one main paper (Ghasemy et al., 2016) has only four (4) citations since publication in 2016 suggesting that this topic remains very much underdeveloped in terms of practical and theoretical advancement. The impact of this on the findings cannot be mitigated and the way forward is to extend this work through a global survey.

Survey design has to take into account the potential impact of social desirability bias (SDB) which arises when respondents answer test questions in such a way as to present themselves in a socially acceptable way (King & Bruner, 2000) (Fisher & Katz, 2000). This particular type of validity bias was first proposed by Edwards (1957) and factor analysis of SDB (Zerbe & Paulhus, 1987) concluded that of the two primary factors "*self-deception*" and "*impression management" - impression management* was the source of SDB. Research into mitigating SDB (Fisher & Hall, 1990) suggests that one of the most critical factors in minimising SDB is ensuring a high level of respondent anonymity (Sudman & Bradburn, 1974). This consideration was factored into the design of the survey and data collection.

The capacity for the responses to be impacted by SDB was considered to be limited to those respondents who saw themselves as being the leadership being evaluated. This can only be evaluated retrospectively as part of the input into future surveys and the continuing research. The application of the Marlowe-Crowne Social Desirability Scale (Crowne & Marlowe, 1960) could be used to establish the discriminating validity of the survey.

Overall ensuring the complete anonymity of respondents was seen as the most effective method of minimising any SDB by removing social exposure.

Practical considerations and access to a supportive sample population limited the survey to two organisations which may have introduced unquantifiable elements of unacknowledged cultural or organisational bias. Plus, the fact that there were only a small number of South African respondents makes reliance on the inter country differences less certain. This survey was seen as the starting place for further research and, whilst this limitation is acknowledged there remains the need to develop one, or maybe more capability frameworks which may have to, for example distinguish between teaching and research universities or between traditional and modern universities.

The comparison with other frameworks revealed a potential issue around capabilities which were composed of two elements such as *"Acts in a professional and ethical manner*" which made comparisons difficult but also raised the issue of lack of clarity as to which element the respondents were focussed on. Whilst the impact cannot be quantified from the current data this will have to be clarified by future research without avoiding over wieldy capability frameworks. Also, the alignment of capabilities around a single guiding purpose as was highlighted by the L4L model is an area of great interest for future research because it aligns a capability framework with organisational purpose. Furthermore, the comparison with L4L also showed that no other leadership framework

acknowledged that any model needs a strong evidence base to measure its effectiveness which is arguably critical if a capability framework is to be susceptible to management and development. The fact that all responses were self-reported data means that there may be inherent personal bias arising from over immersion in one institution or commenting on issues outside personal experience.

6.3 Future work

Based on the examination of the results and with reference to the limitation of findings the areas for future work in broad order of priority would be:

a. Conducting further research to refine the survey for a global population. This would be to test one or more of the concepts that the capabilities would need a central guiding purpose; that capabilities only work if managed using validating data and that the capabilities may be reflect the different types of university.
b. Further research analysing the results from those surveys to refine and test the capabilities with cross comparison and potential collaboration with other organisations.
c. Extending the research into the variances between “importance” and “development” of the capabilities to develop evidence-based leadership training programs for universities.
d. Expand the survey to other countries to explore the development of leadership across various education systems.

A brief examination of the most recent work into capabilities suggests that this survey has anticipated the emerging focus on generic and industry specific capabilities.
Driven by the concerns over the impact of automation on today’s workforce have raised the issues of reskilling and future capabilities (Bowles, 2018).
Both these questions directly relate to the future of universities and their response to market demand (Oliver, 2016).
In an Australian context the response to this comes from a few universities (Bowles, 2018; Bowles et al., 2016)
Universities, together with more globally focussed institutions, have tried to define the capabilities of the workforce of the future as shown in the table below.

Table 6-1: Research into Future Capabilities

Oxford Martin School (2016)	DeakinCo. (2014)	OECD Global Workforce Core Competencies (2016)	Department of Education Foundations Skills (2015)	World Economic Forum Top 10 Future Skills Australia (2018)
Sense-making	Self-management	Analytical thinking	Self-management	Creativity, originality & initiative
Social intelligence	Communication	Flexible Thinking	Communication	Analytical thinking & innovation
Novel and adaptive thinking	Teamwork	Strategic Thinking	Teamwork	Active learning & learning strategies
Cross-cultural competency	Problem Solving	Manage Resources	Problem Solving	Technology design & programming
Computational thinking	Critical Thinking	Achievement Focus	Technology	Complex problem-solving
New media Literacy	Digital Literacy	Diplomatic Sensitivity	Learning	Critical thinking & analysis
Transdisciplinary	Global Citizenship	Teamwork & Team Leadership	Interactive & Enterprise Skills	Leadership and social influence
Design Mindset	Innovation	Organisational knowledge & alignment	Planning & Organising	Emotional intelligence
Cognitive Load Management	Professional Ethics	Negotiating and Influencing		Reasoning, problem-solving & ideation
Virtual Collaboration	Emotional Judgement			Resilience, stress tolerance & flexibility

(Bowles, 2018)

Certain Australian private sector organisations such as the Chartered Accountants and Engineers Australia have sought to define a more industry specific set of capabilities (Bowles, 2018) which mirrors the objectives of this thesis.

The grouping and the specific capabilities are, at this stage, the product of a specific developmental process and the culture of the organisation.

The lesson to be gained from this is that the work in this thesis was and is very much in line with the emerging trend of organisation specific focus and supports the continuation of this work in further research.

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Appendix 1 Survey

TEXT VERSION MOCK-UP OF ONLINE SURVEY

Validating Leadership Capabilities in Higher Education Questionnaire

CONSENT FORM/PAGE

I have read the information on the information sheet. Any questions I have asked have been answered to my satisfaction. I agree to participate in this research and understand that I can change my mind or stop at any time. I understand that all information provided by me is treated as confidential. I agree that the research information gathered for this study will not identify me personally nor attribute any results against me personally and as such may be published.

- I understand the purpose and procedures of this study.
- I have been provided with the participant information sheet.
- I understand that my involvement is voluntary and that I can withdraw at any time without any problem.
- I understand that no personal identifying information, like my name and address, will be used in the research report and that all information will be securely stored for 5 years before being destroyed.
- I have been given the opportunity to ask questions and to make any comments relevant to the research and to my role.
- I agree to participate in the study outlined to me.

I have read and agree to the terms above.

Commence the Survey>>>>> By clicking here you consent to the above

Validating Leadership Capabilities in Higher Education Questionnaire

Please answer this questionnaire using your own personal perspectives/thoughts. The questionnaire is divided into 3 Parts: (A) Demographic; (B) Leadership capabilities and (C) Management Capabilities.

PART A: Demographic questions: *Please choose the correct response.*

Q1. Your gender: (*Drop down selection box)*

- Male
- Female

Q2. Your Country of residence: *(Drop down selection box)*

- *Australia*
- *South Africa*

Q3. In what capacity are you predominantly employed: (*Drop down selection box)*

- *Academic*
- *Professional*

Q4. Which of the following levels of leadership would best describe your current leadership position: (*Drop down selection box)*

Dean
Professor
Associate Professor
Senior lecturer/Course co-ordinator
Unit co-ordinator
Director/Deputy Director
Senior professional staff (HEO 8+)
Team leader (HEO 6-7)
Senior staff (HEO 4-5)

Q5. Please specify you age range (*Drop down selection box)*

- *Up to 25 years*
- *26–30 years*
- *31–35 years*
- *36–40 years*
- *41–45 years*
- *46–50 years*
- *51–55 years*
- *56–60 years*
- *61–65 years*
- *66–70 years*
- *Over 70 years*

PART B: Validation of leadership capabilities. Rate *the following leadership capabilities by importance and current development attention in higher education. For each capability select one response for <u>your opinion</u> as to how important it is to leaders in higher education and one response for how successfully it is being developed.*

Leadership Capabilities & Descriptions	How important is this leadership capability in the higher education?						To what extent to you agree this leadership capability is being successfully developed in the higher education?					
	Not at all important	Mostly unimportant	Moderately important	important	Very important	No opinion	Completely disagree	Disagree	Mildly agree	Agree	Strongly agree	No opinion
LEADERSHIP CAPABILITIES: SELF MASTERY	**0**	**1**	**2**	**3**	**4**							
1. Develops self Identifies personal strengths and weakness and takes responsibility for developing required knowledge, skills and personal attributes (personal behaviours, preferences and styles). This includes being confident to actively pursue and engage in professional development.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2. Communicates with clarity Communicates clearly to a person or audience, actively listen to others and responds to build shared understanding.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
3. Acts in a professional and ethical manner Acts in an ethics manner and consistently maintains professional standards and codes of conduct. This includes ongoing promoting the highest standards of organisational behaviour and ethical practices.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
4. Displays personal resilience Deals with pressure, setbacks and challenges in an optimistic manner while learning from experience. This includes providing impartial advice, making tough decisions to achieve desired outcomes, monitoring personal emotional reactions and responds to pressure in a controlled manner, and recovering rapidly when dealing with difficult situations or setbacks.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Leadership Capabilities & Descriptions	How important is this leadership capability in the higher education?						To what extent to you agree this leadership capability is being successfully developed in the higher education?					
	Not at all important	Mostly unimportant	Moderately important	important	Very important	No opinion	Completely disagree	Disagree	Mildly agree	Agree	Strongly agree	No opinion
LEADERSHIP CAPABILITIES: INTERPERSONAL MASTERY												
5. Connects with stakeholders and builds collaborative relationships Works collaboratively and builds networks with internal and external stakeholders, in particular parents, employers and the wider community. This includes being able to build personal, community, educational, and professional networks and relationships that can be mobilised to support the attainment of organisational and learning goals.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
6. Leads and empowers others Models positive attitudes and motivates people both to commit to and take responsibility for completing agreed actions. This includes delegating sufficient authority and responsibility while empowering people in their learning and work to achieve or exceed agreed objectives.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
7. Displays emotional judgement The ability to build rapport and to recognise and manage one's own emotions and to respond appropriately to the emotions of others in order to promote constructive interpersonal interaction to improve performance. This includes restraining disruptive impulses, expressing emotions appropriately, being a stabilising influence and motivating others through trust and confidence	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
8. Embraces individual and cultural differences Sensitivity to prevailing cultures and capacity to work effectively with a diversity of people and in a range of cultural contexts. This includes demonstrating cross cultural competence, regard and respect for differences and effectively promoting a positive culture	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Leadership Capabilities & Descriptions	How important is this leadership capability in the higher education?						To what extent to you agree this leadership capability is being successfully developed in the higher education?					
	Not at all important	Mostly unimportant	Moderately important	important	Very important	No opinion	Completely disagree	Disagree	Mildly agree	Agree	Strongly agree	No opinion
LEADERSHIP CAPABILITIES: PROCESS MASTERY												
9. Builds positive conditions for learning Enables and enhances the conditions for learning, including the physical, virtual, social and emotional environment.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
10. Plans and coordinates quality curriculum, learning and teaching Plans, executes and reviews quality of curriculum, learning and teaching. Coordinates projects to improve student engagement and to continuous improve learning and assessment processes and outcomes, including through more effective use of technology and innovations.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
11. Instils a focus on priority actions and educational outcomes Remains action focussed and continually evaluates and effectively focusses operational effort and the effective use of resources to achieve superior educational results and outcomes.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
12. Leads change Envisions, manages and executes change. This includes modelling positive attitudes to change and also inspiring students, fellow professionals, staff and stakeholders to undertake a change process to achieve agreed objectives.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Leadership Capabilities & Descriptions	How important is this leadership capability in the higher education?						To what extent to you agree this leadership capability is being successfully developed in the higher education?					
	Not at all important	Mostly unimportant	Moderately important	important	Very important	No opinion	Completely disagree	Disagree	Mildly agree	Agree	Strongly agree	No opinion
LEADERSHIP CAPABILITIES: SYSTEMS MASTERY												
13. Develops a shared moral purpose and vision Engages others to develop a sustained commitment to a vision that embraces student learning and achievement as part of a higher moral purpose and direction.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
14. Fosters a learning culture The ability to build and reinforce a culture of learning where everyone has a shared set of values and commitment to enhance individual and community benefit from learning. This includes recognising cultural differences while building a climate of participation and collaboration	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
15. Thinks and acts strategically Draws on professional and strategic implications and conclusions within a highly complex organisational, learning and professional environment. This will include the translation of thinking into action in support of the strategic objectives set by the organisation.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
16. Fosters innovation and creativity Stimulates and promotes the ability of individuals, groups, students and the organisation to innovation, adapt and think creatively. This includes being able to identify and address root causes and practices that may hinder innovation or limit efforts to transform thinking and existing practices.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Appendix 2 Graphical comparisons between 'Importance' and 'Development'

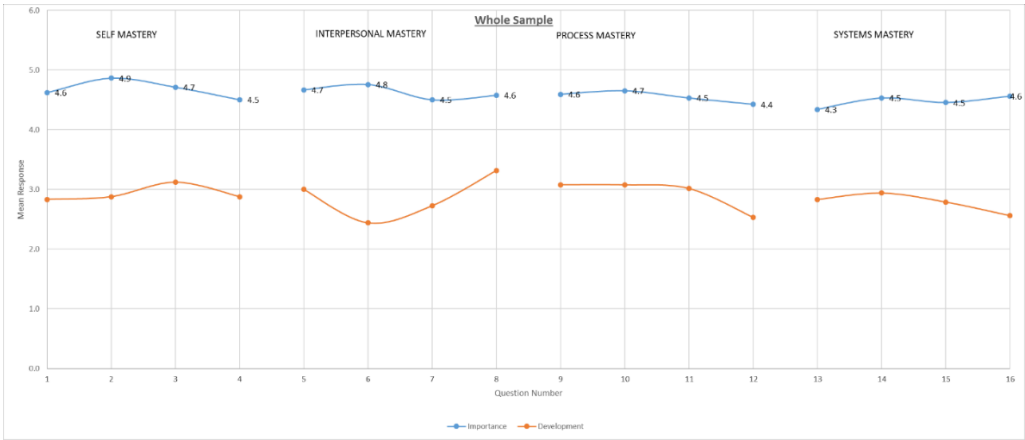


Figure A2-1 Whole sample

Results by demographic groups

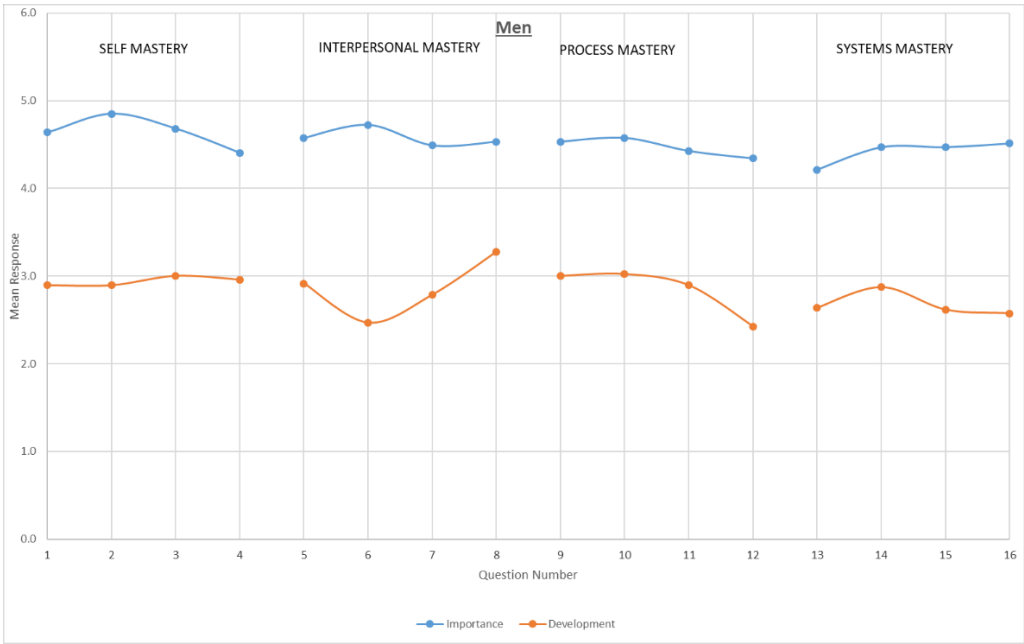


Figure A2-2 Men

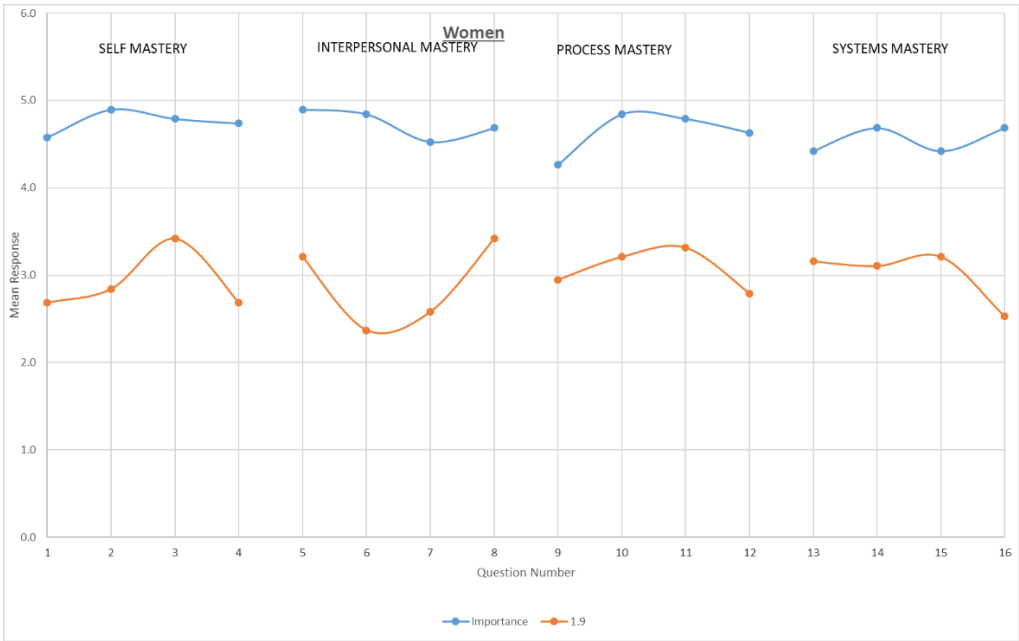


Figure A2-3 Women

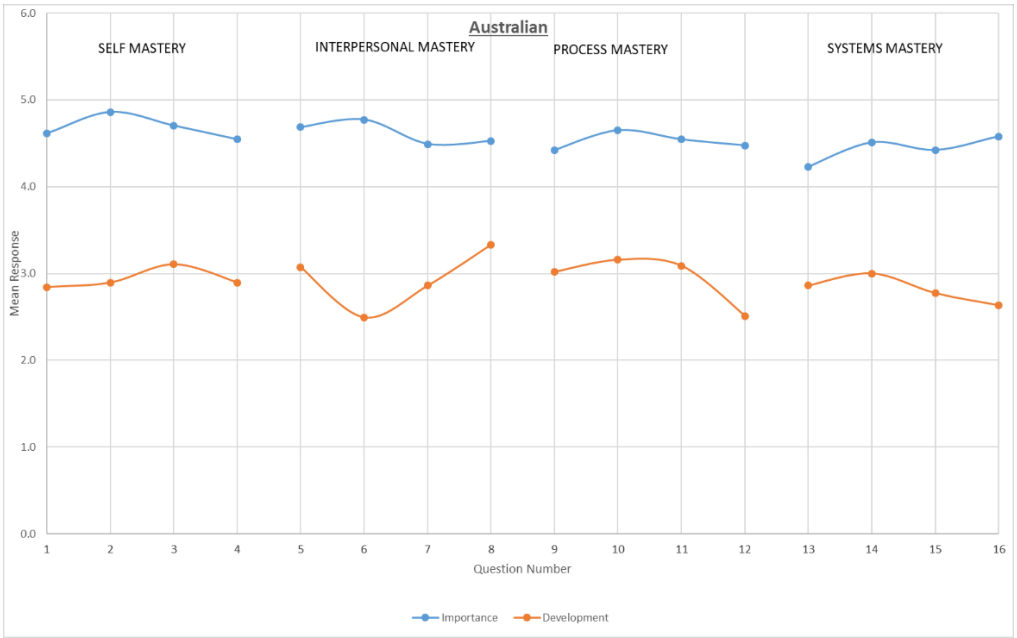


Figure A2-4 Australian

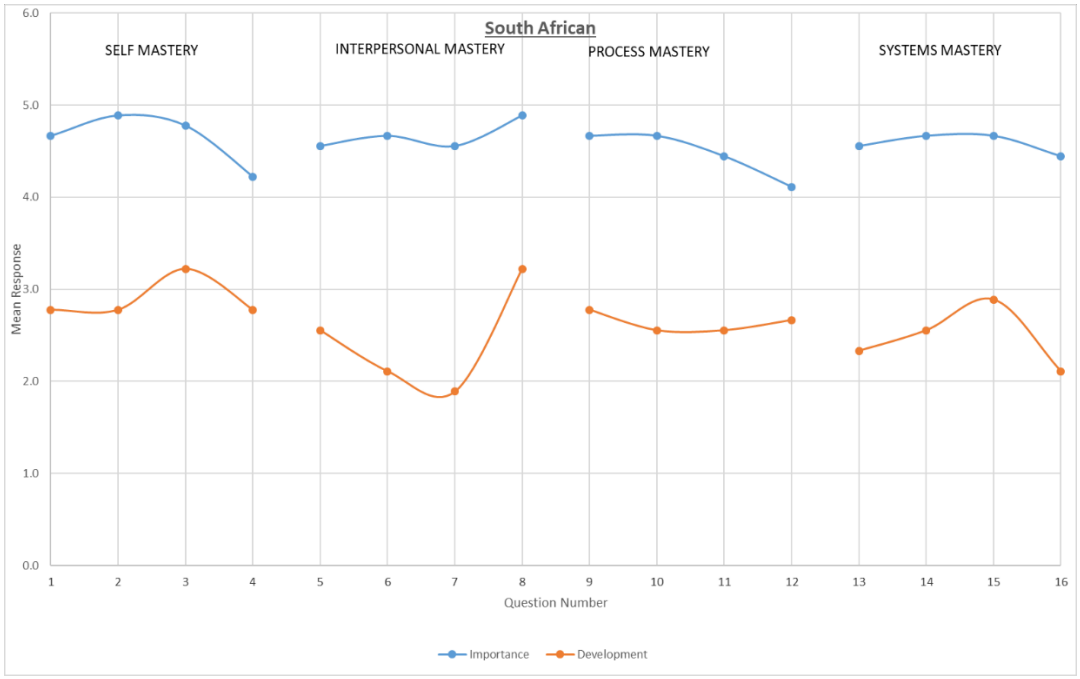


Figure A2-5 South African

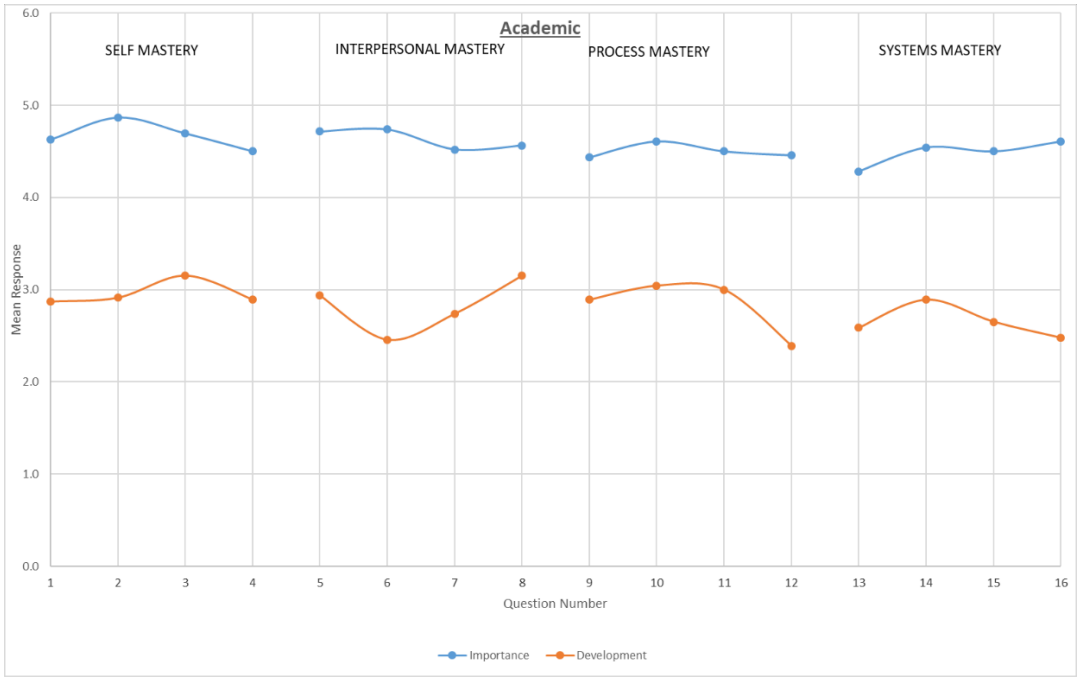
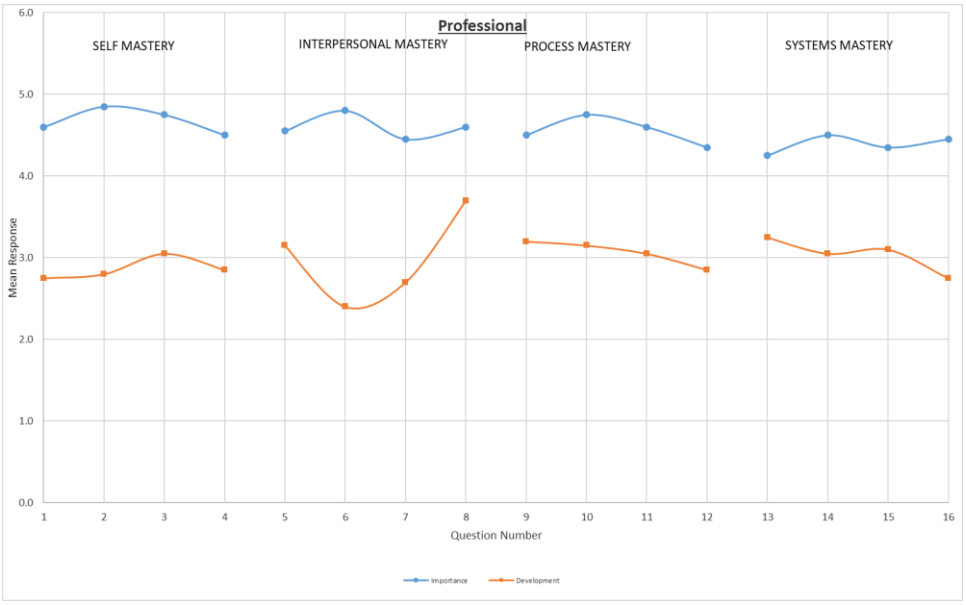


Figure A2-6 Academic



FigureA2-7 Professional

These results allow a direct visual comparison to be made between the importance of a capability and the level to which it has been developed.

Appendix 3 Importance - Graphical rankings by demographic pairs

Importance of Capabilities by Individual Demographic

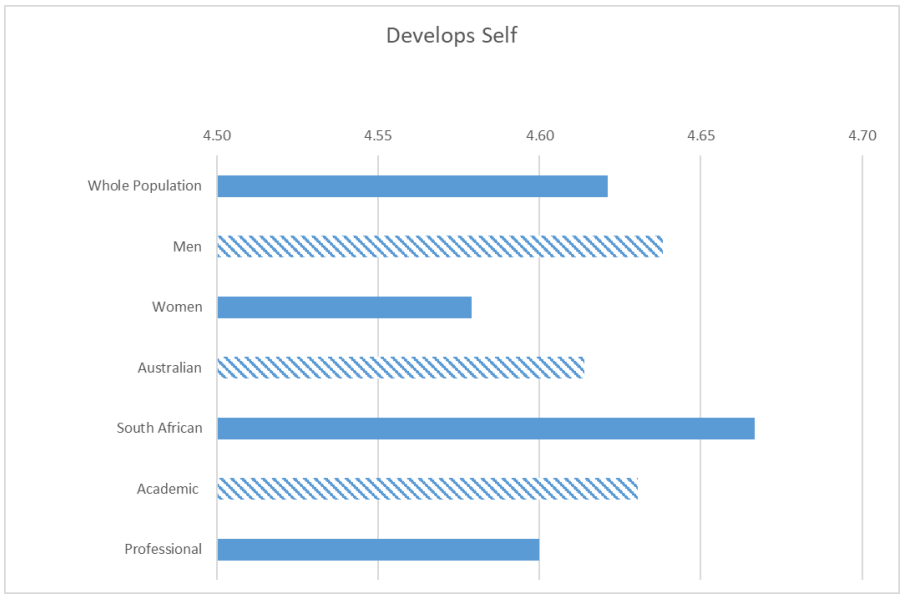


Figure A3.1 Develops Self

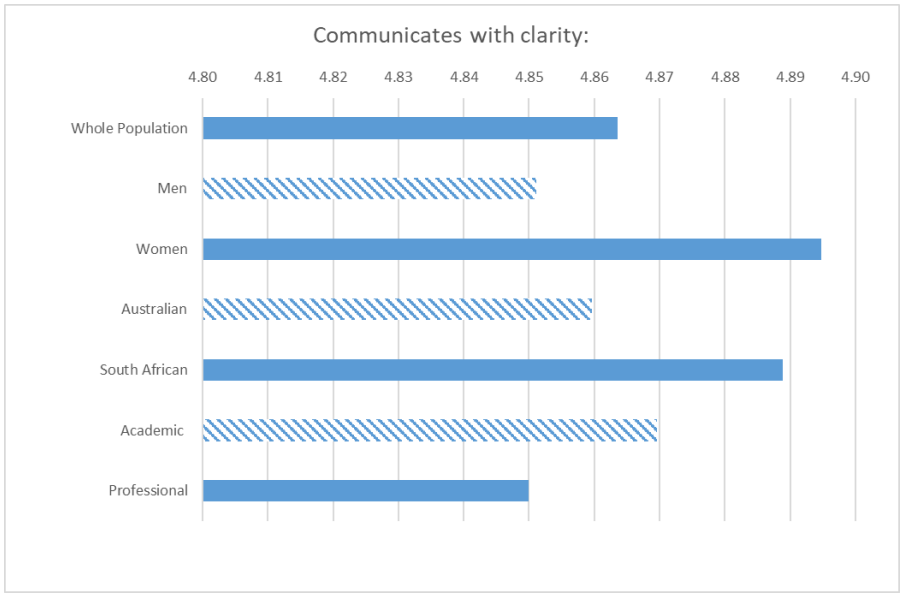


Figure A3.2 Communicates with Clarity

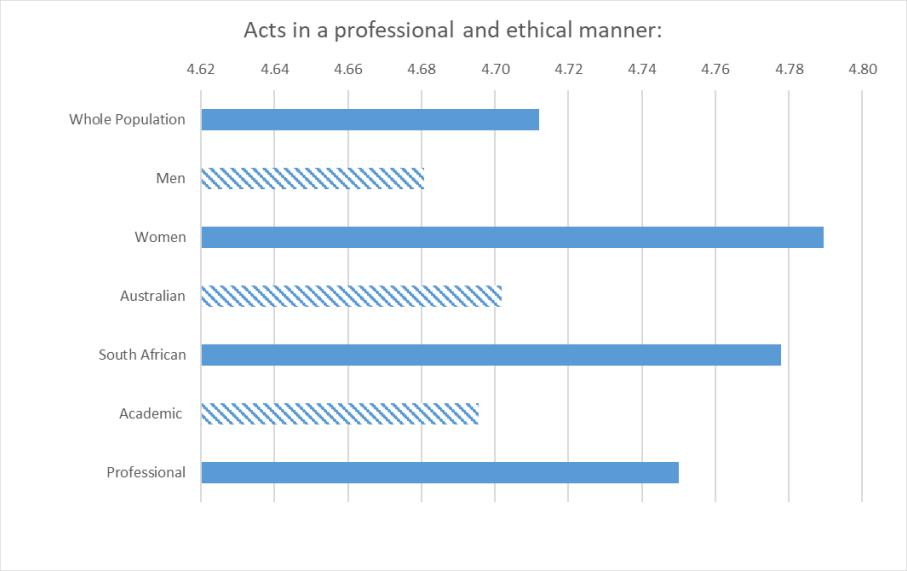


Figure A3.3 Acts in a Professional and Ethical Manner

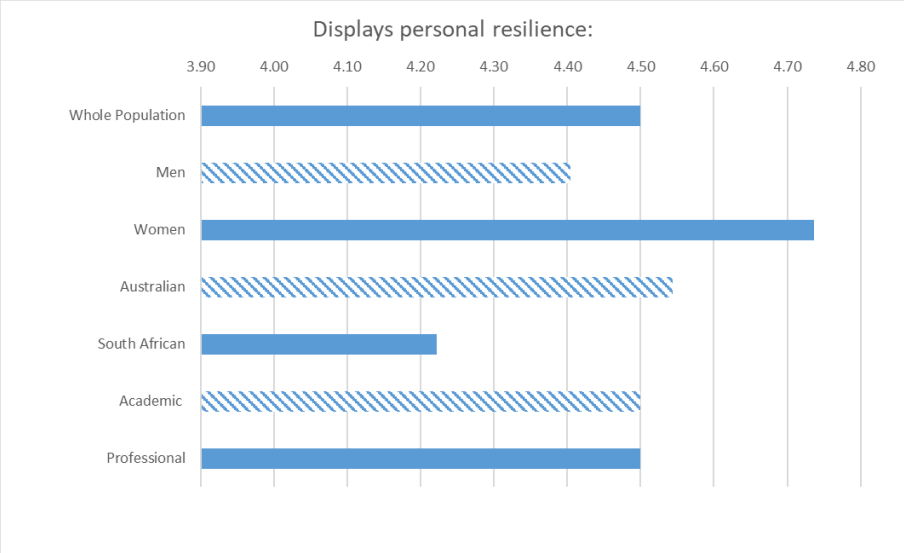


Figure A3.4 Displays Personal Resilience

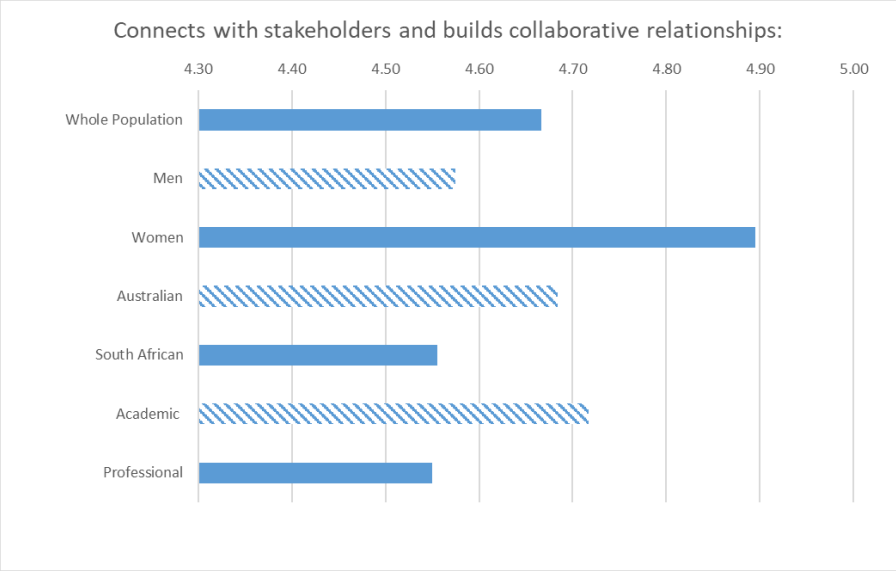


Figure A3.5 Connects with Stakeholders

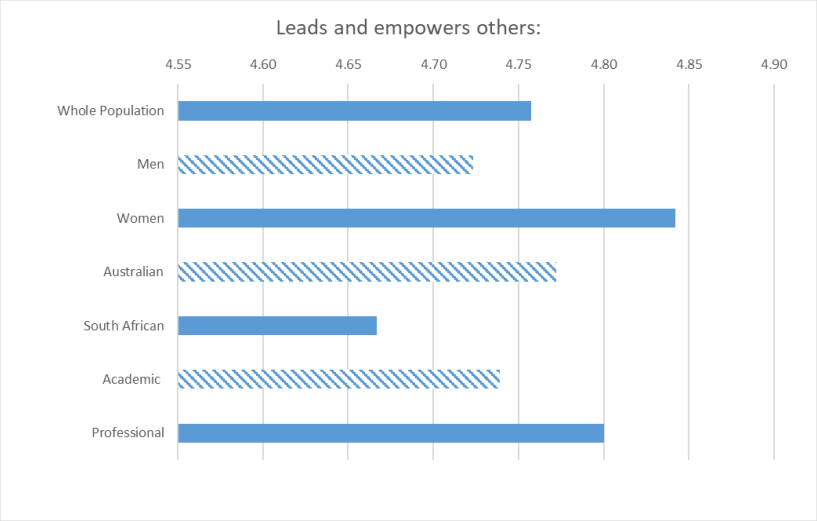


Figure A3.6 Leads and Empowers Others

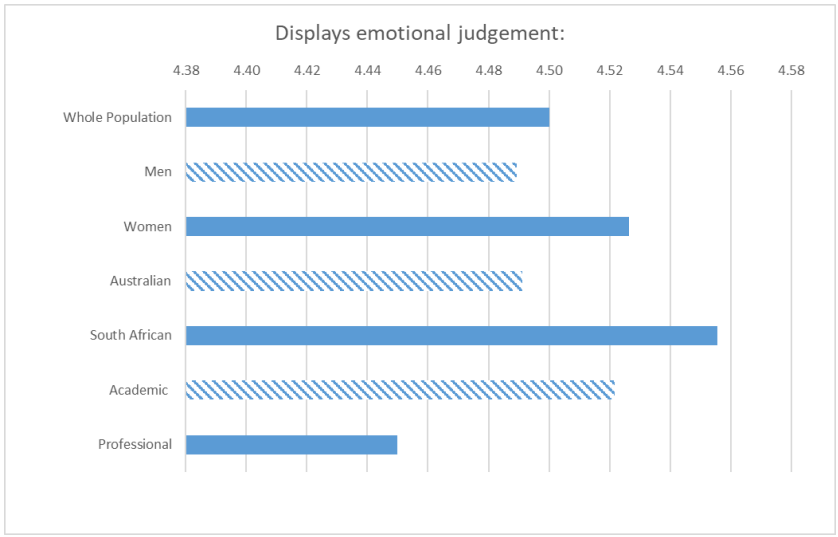


Figure A3.7 Displays Emotional Judgement

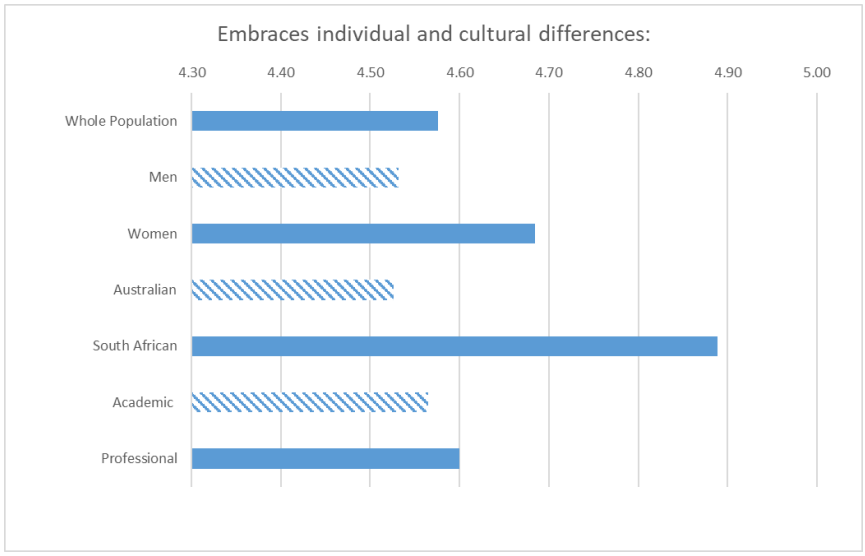


Figure A3.8 Embraces Individual and Cultural Differences

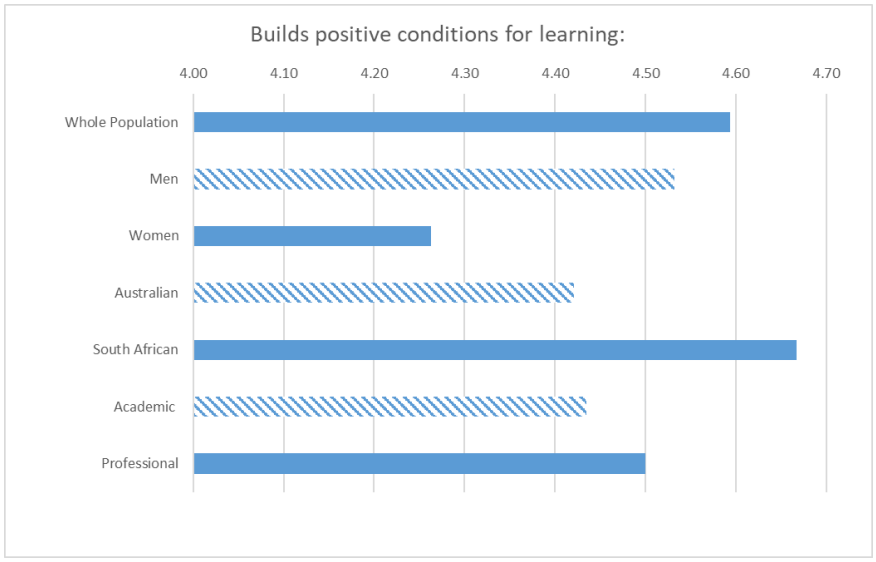


Figure A3.9 Builds Positive Conditions for Learning

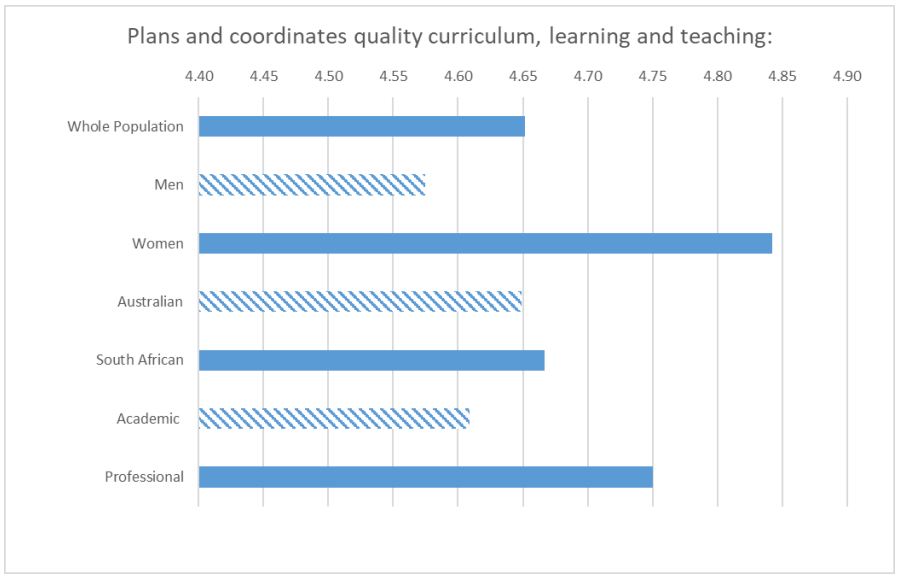


Figure A3.10 Plans and Co-ordinates Quality Curriculum

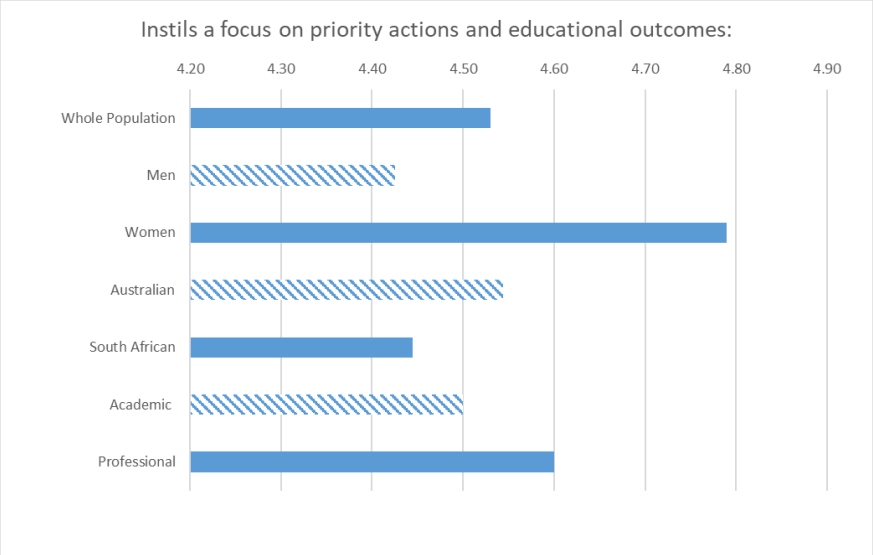


Figure A3.11 Instils a Focus on Priority Actions and Educational Outcomes

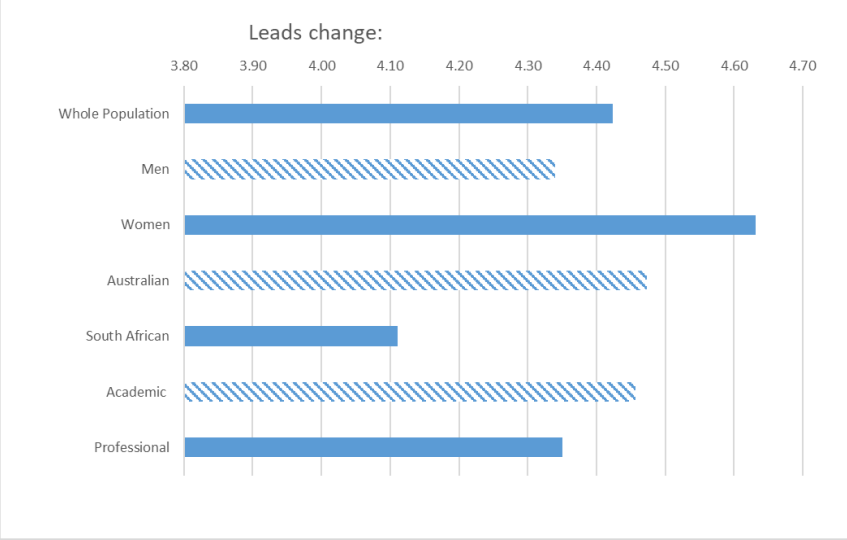


Figure A3.12 Leads Change

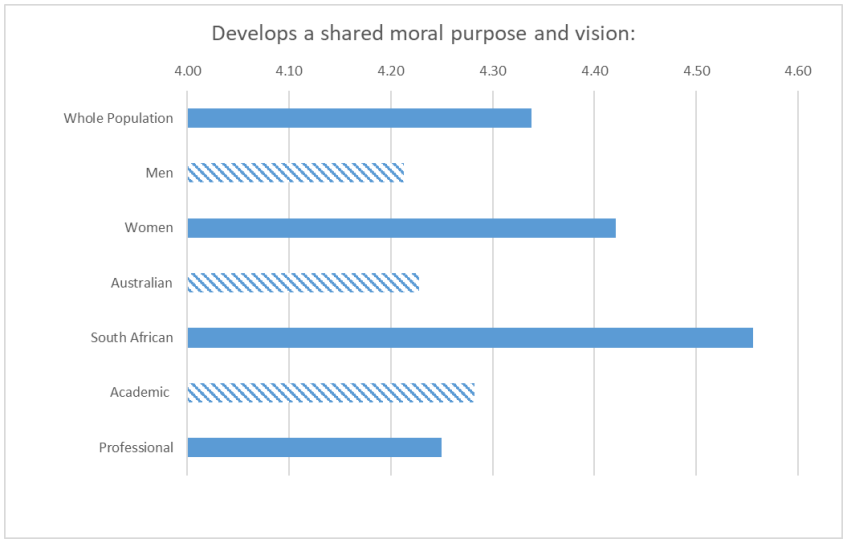


Figure A3.13 Develops a Shared Moral Purpose and Vision

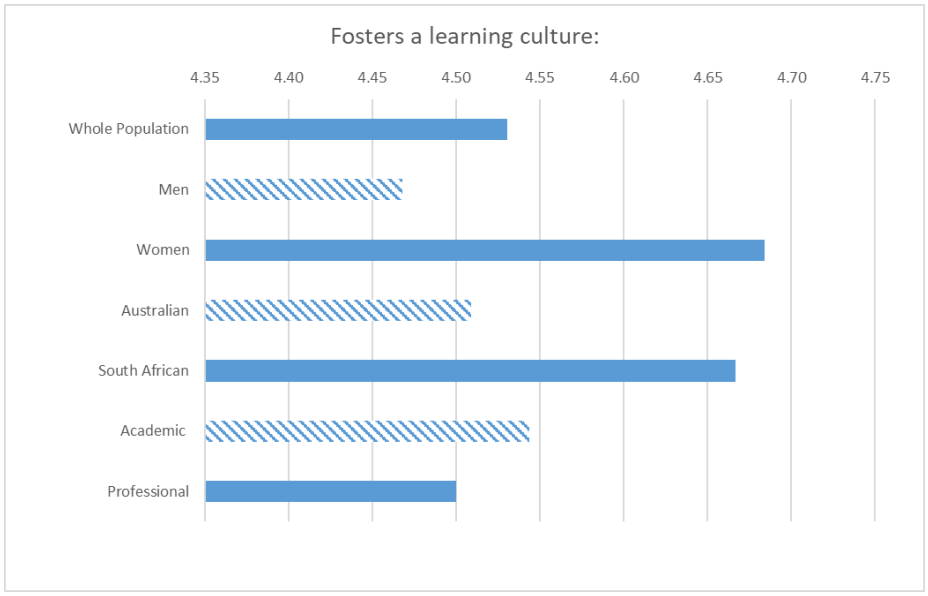


Figure A3.14 Fosters a Learning Culture

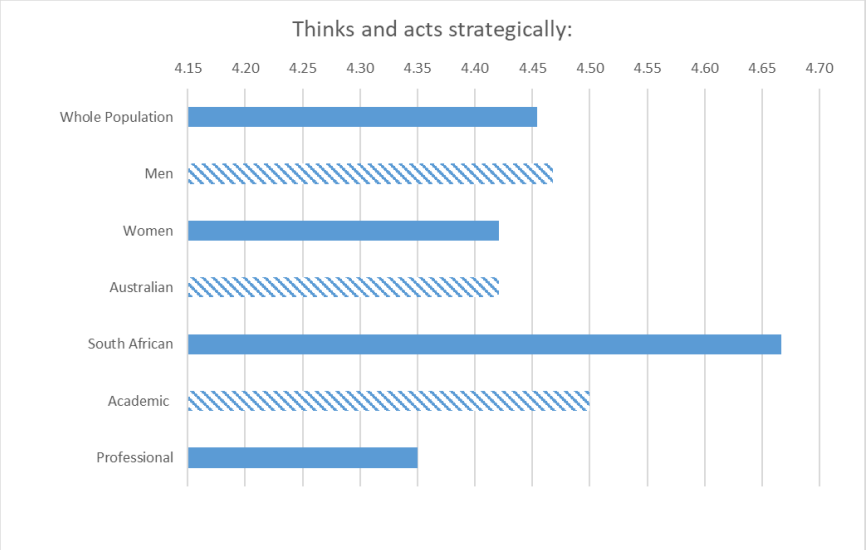


Figure A3.15 Thinks and Acts Strategically

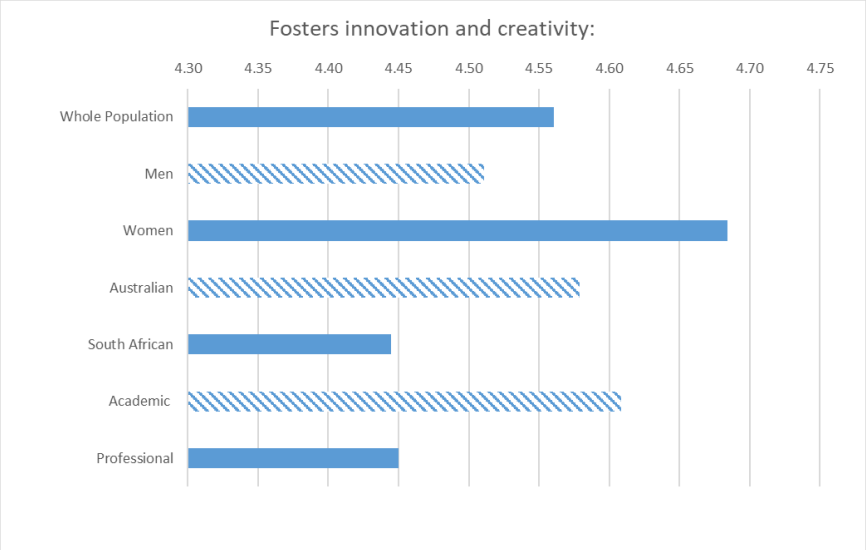


Figure A3.16 Fosters Innovation and Creativity

Appendix 4 Development - Graphical rankings by demographic pairs

Development of Capabilities by Individual Demographic

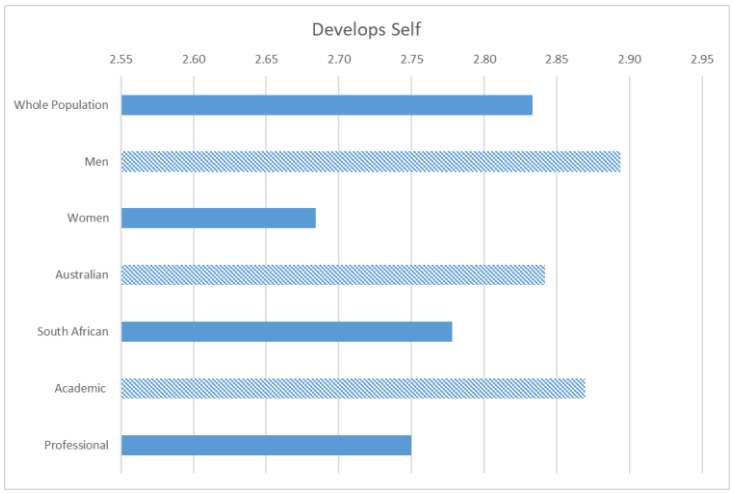


Figure A4.1 – Develops Self

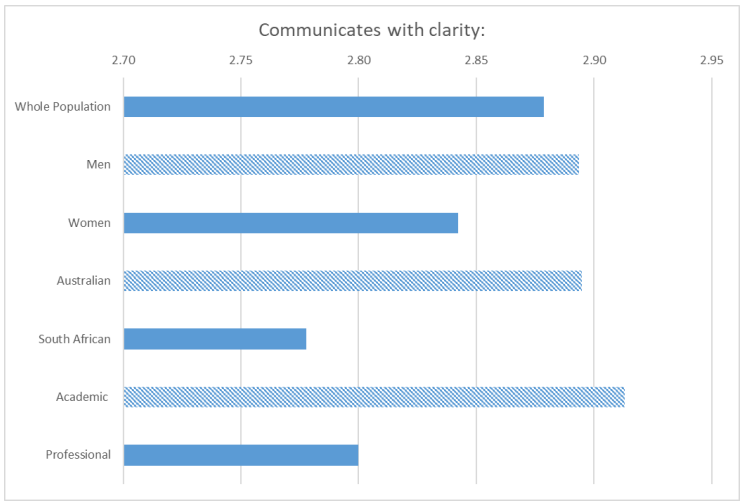


Figure A4.2 -Communicates with Clarity

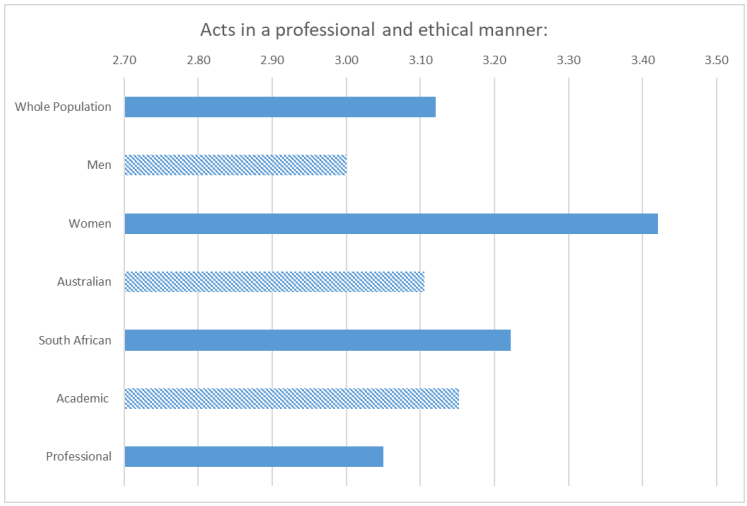


Figure A4.3 Acts in a professional and Ethical Manner

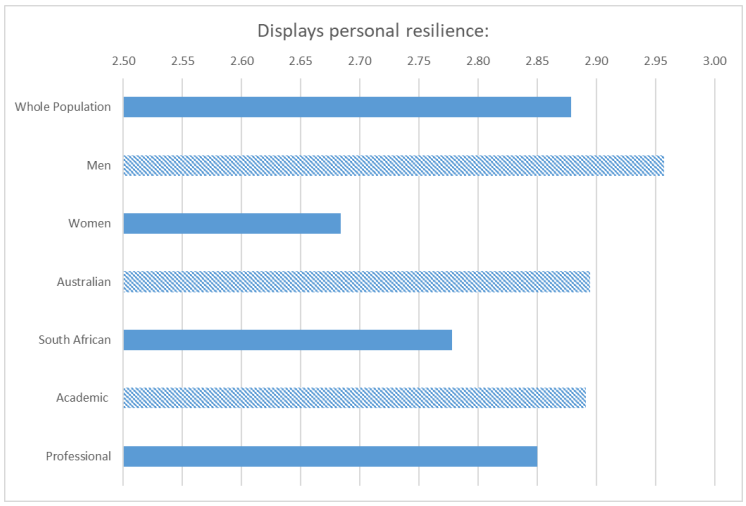


Figure A4.4 – Displays Personal Resilience

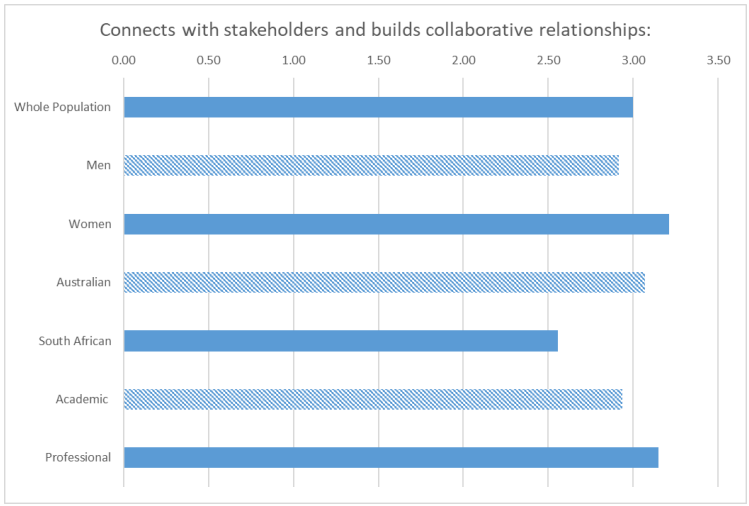


Figure A4.5 Connects with Stakeholders and builds Collaborative Relationships

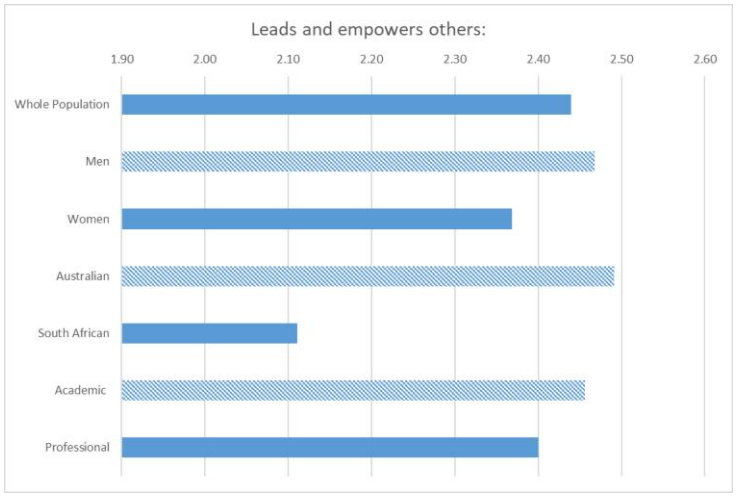


Figure A4.6 Leads and Empowers Others

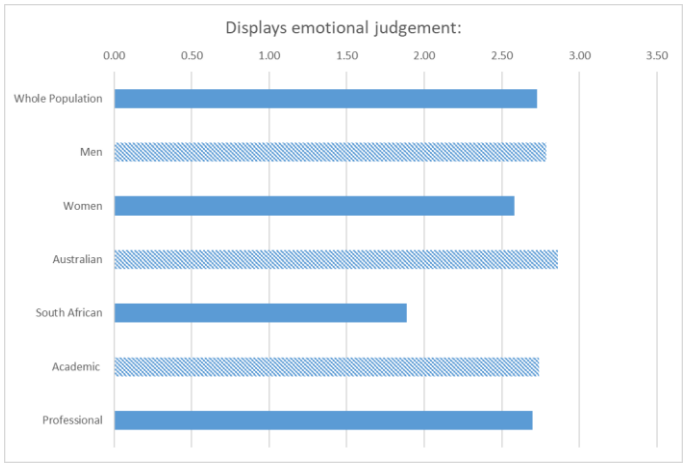


Figure A4.7 Displays Emotional Judgement

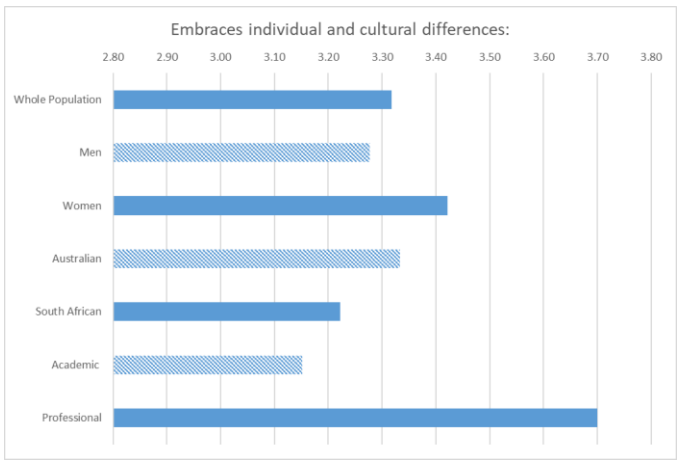


Figure A4.8 Embraces Individual and Cultural Differences

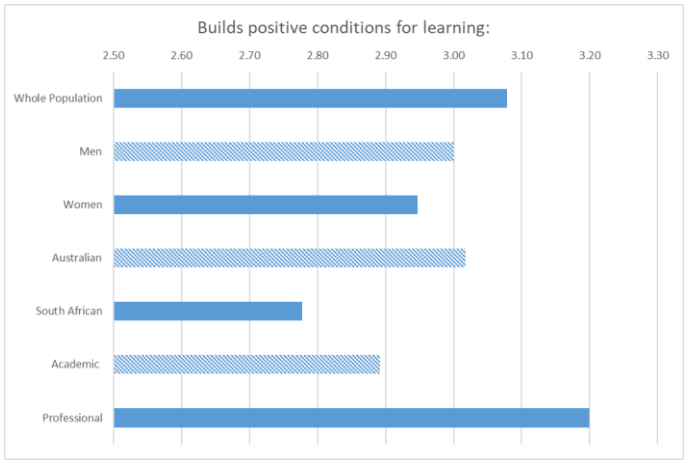


Figure A4.9 Builds Positive Conditions for Learning

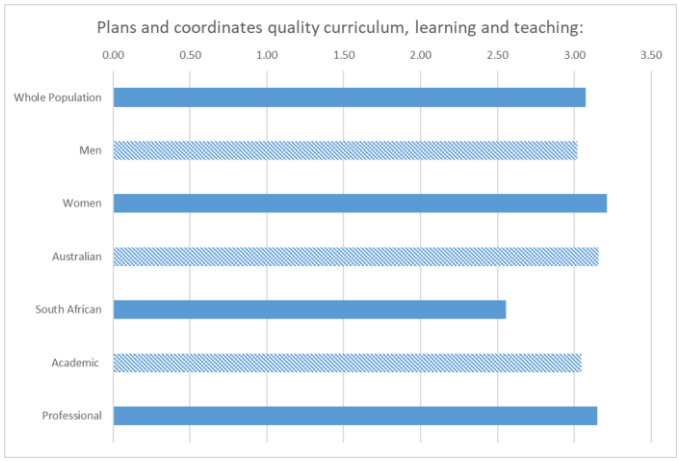


Figure A4.10 Plans and Co-ordinates Quality Curriculum, Learning and Teaching

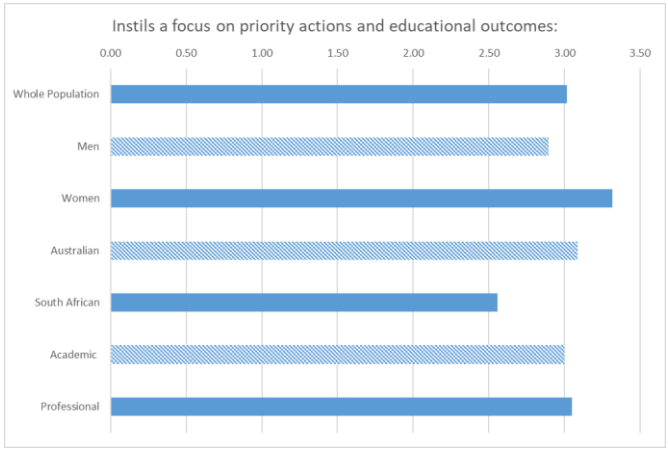


Figure A4.11 Instils a Focus on Priority Actions and Educational Outcomes

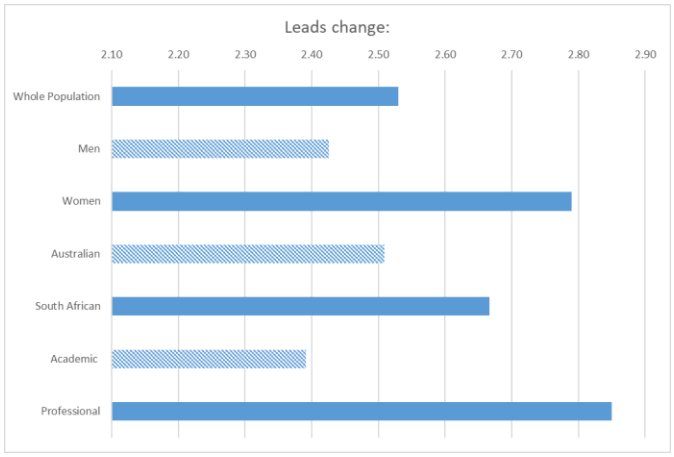


Figure A4.12 Leads Change

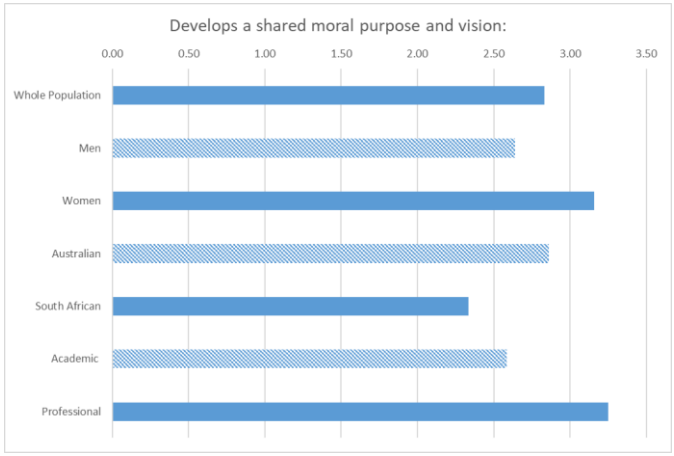


Figure A4.13 Develops a Shared Moral Purpose and Vision

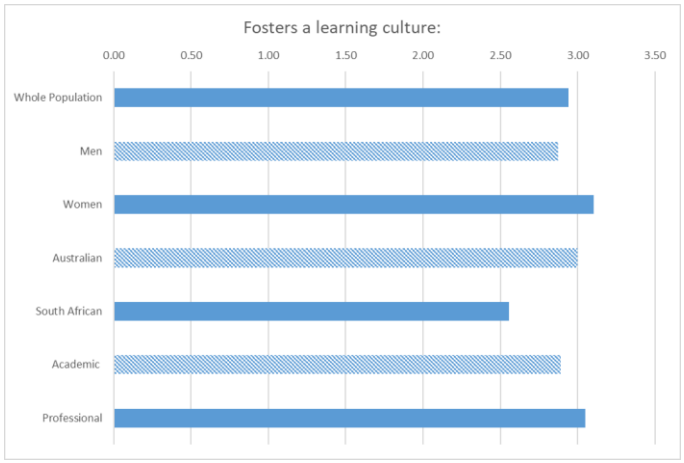


Figure A4.14 Fosters a Learning Culture

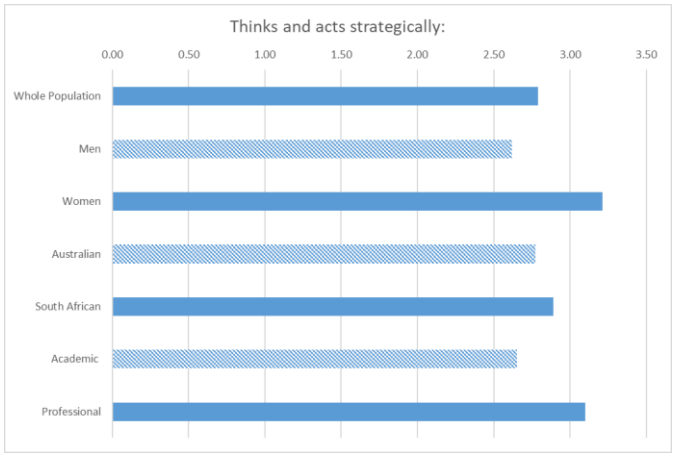


Figure A4.15 Thinks and Acts Strategically

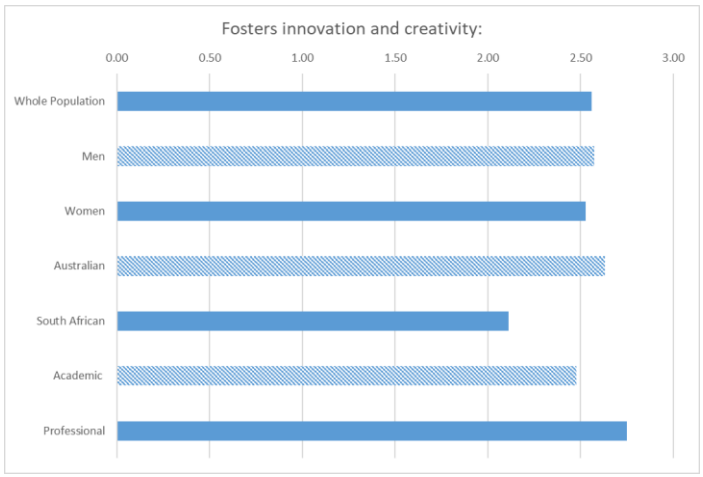


Figure A4.16 Fosters Innovation and Creativity

Appendix 5 MATLAB Statistically Significant Results – Numerical Data

MATLAB EXTRACT – SINGLE CAPABILITIES – ALL RESPONSES – IMPORTANCE

Table 5.1 MATLAB EXTRACT – SINGLE CAPABILITIES – ALL RESPONSES – IMPORTANCE

Question: IO Strategy, code=33, discretes=5

		Gender	Country	Capacity	Position
Pearson	1	0.4166	0.5081	0.1353	0.0466
Not at all important	2a				
Not at all important	2b				
Mostly unimportant	3a	0.9488	0.6228	0.191	0.0378
Mostly unimportant	3b	0.4507	0.3496	0.1223	0.0266
Moderately important	4a	0.1933	0.5303	0.1776	0.5845
Moderately important	4b	0.1022	0.2794	0.0909	0.3288
Important	5a	0.3771	0.3433	0.9541	0.268
Important	5b	0.1978	0.178	0.4911	0.1473

Position	Academics	Professional
# of observations	40	25
Relative Frequency		
of the Discrete 'Mostly Unimportant'	0.0000	0.1200
Relative Frequency		
of the Discrete 'Moderetely Important'	0.0750	0.0400
Relative Frequency		
of the Discrete 'Important'	0.9250	0.8400

Question: IO Creativity, code=35, discretes=5

		Gender	Country	Capacity	Position
Pearson	1	0.5285	0.6091	0.0354	0.0525
Not at all important	2a				
Not at all important	2b				
Mostly unimportant	3a				
Mostly unimportant	3b				
Moderately important	4a	0.5515	0.621	0.0549	0.0835
Moderately important	4b	0.3043	0.3872	0.0474	0.0654
Important	5a	0.5515	0.621	0.0549	0.0835
Important	5b	0.3043	0.3872	0.0474	0.0654
Very Important	6a				
Very Important	6b				

Capacity	Sample 1	Sample 2
# of observations	46	20
Relative Frequency		
of the Discrete 'Moderetely Important'	0.0000	0.1000
Relative Frequency		
of the Discrete 'Important'	1.0000	0.9000

Table 5.2 MATLAB EXTRACT – SINGLE CAPABILITIES – GROUPED RESPONSES – IMPORTANCE

Question: IO Strategy, code=33, discretes=3

		Capacity	Position
Pearson	1	0.1432	0.0489
Mostly unimportant	3a	0.1923	0.0403
Mostly unimportant	3b	0.1243	0.027
Moderately important	4a	0.1804	0.5869
Moderately important	4b	0.0932	0.324
Important	5a	0.9555	0.2847
Important	5b	0.4929	0.1586

Position	Sample 1	Sample 2
# of observations	40	25
Relative Frequency		
of the Discrete 'Mostly Unimportant'	0.0000	0.1200
Relative Frequency		
of the Discrete 'Moderetely Important'	0.0750	0.0400
Relative Frequency		
of the Discrete 'Important'	0.9250	0.8400

Question: IO Creativity, code=35, discretes=3

		Capacity	Position
Pearson	1	0.0318	0.0514
Mostly unimportant	3a		
Mostly unimportant	3b		
Moderately important	4a	0.0495	0.0865
Moderately important	4b	0.0434	0.0656
Important	5a	0.0495	0.0865
Important	5b	0.0434	0.0656

Capacity	Sample 1	Sample 2
# of observations	46	20
Relative Frequency		
of the Discrete 'Mostly Unimportant'		
Relative Frequency		
of the Discrete 'Moderetely Important'	0.0000	0.1000
Relative Frequency		
of the Discrete 'Important'	1.0000	0.9000

Table 5.3 MATLAB EXTRACT – SINGLE CAPABILITIES – ALL RESPONSES - DEVELOPMENT

Question: SD Selfdevelopment, code=6, discretes=5

		Gender	Country	Capacity	Position
Pearson	1	0.6831	0.2184	0.7338	0.2186
Completely Disagree	2a	0.9458	0.5831	0.9483	0.2995
Completely Disagree	2b	0.4484	0.3139	0.46	0.1672
Disagree	3a	0.8945	0.6003	0.6032	0.8368
Disagree	3b	0.4419	0.312	0.2952	0.4235
Mildly Agree	4a	0.4652	0.035	0.9768	0.5082
Mildly Agree	4b	0.2398	0.0178	0.4833	0.259
Agree	5a	0.4072	0.1607	0.3669	0.444
Agree	5b	0.2188	0.0695	0.1891	0.2296
Strongly Agree	6a	0.4174	0.6242	0.55	0.0844
Strongly Agree	6b	0.4174	0.3858	0.3139	0.0658

Country	Sample 1	Sample 2
# of observations	9	57
Relative Frequency		
Completely Disagree	0.0000	0.0526
Relative Frequency		
Disagree	0.2222	0.3158
Relative Frequency		
Mildly Agree	0.7778	0.4035
Relative Frequency		
Agree	0.0000	0.1930
Relative Frequency		
Strongly Agree	0.0000	0.0351

Question: SD Communicativity, code=8, discretes=5

		Gender	Country	Capacity	Position
Pearson	1	0.1847	0.8177	0.4189	0.6106
Completely Disagree	2a	0.9489	0.5899	0.9485	0.2674
Completely Disagree	2b	0.4559	0.3143	0.4555	0.1559
Disagree	3a	0.1209	0.8216	0.8353	0.6449
Disagree	3b	0.06	0.4121	0.4188	0.334
Mildly Agree	4a	0.042	0.6587	0.3445	0.6721
Mildly Agree	4b	0.0229	0.3308	0.1728	0.3353
Agree	5a	0.3756	0.6405	0.1051	0.5354
Agree	5b	0.2002	0.3451	0.0471	0.27
Strongly Agree	6a				
Strongly Agree	6b				

Gender	Sample 1	Sample 2
# of observations	45	19
Relative Frequency		
Completely Disagree	0.0444	0.0526
Relative Frequency		
Disagree	0.3556	0.1579
Relative Frequency		
Mildly Agree	0.4000	0.6842
Relative Frequency		
Agree	0.2000	0.1053
Relative Frequency		
Strongly Agree		

Capacity	Sample 1	Sample 2
# of observations	45	19
Relative Frequency		
Completely Disagree	0.0444	0.0526
Relative Frequency		
Disagree	0.2889	0.3158
Relative Frequency		
Mildly Agree	0.4444	0.5789
Relative Frequency		
Agree	0.2222	0.0526
Relative Frequency		
Strongly Agree		

Question: SD Ethics, code=10, discretes=5

		Gender	Country	Capacity	Position
Pearson	1	0.1384	0.23	0.4133	0.2775
Completely Disagree	2a	0.5424	0.3302	0.2857	0.1548
Completely Disagree	2b	0.3033	0.1717	0.1586	0.0816
Disagree	3a	0.801	0.9016	0.19	0.2088
Disagree	3b	0.3983	0.4288	0.0979	0.1038
Mildly Agree	4a	0.067	0.2297	0.7921	0.9856
Mildly Agree	4b	0.0307	0.1271	0.3995	0.4827
Agree	5a	0.0302	0.2446	0.5796	0.6191
Agree	5b	0.0166	0.1214	0.2987	0.3159
Strongly Agree	6a	0.4218	0.1391	0.4209	0.294
Strongly Agree	6b	0.2462	0.1341	0.2248	0.1683

Gender	Sample 1	Sample 2
# of observations	47	18
Relative Frequency		
Completely Disagree	0.1064	0.0556
Relative Frequency		
Disagree	0.1915	0.2222
Relative Frequency		
Mildly Agree	0.3404	0.1111
Relative Frequency		
Agree	0.3191	0.6111
Relative Frequency		
Strongly Agree	0.0426	0.0000

Question: SD Resilience, code=12, discretes=5

		Gender	Country	Capacity	Position
Pearson	1	0.4272	0.0838	0.1644	0.4069
Completely Disagree	2a	0.9474	0.2848	0.9547	0.9159
Completely Disagree	2b	0.4543	0.2135	0.4848	0.4818
Disagree	3a	0.7752	0.9509	0.1062	0.3973
Disagree	3b	0.4012	0.5024	0.0525	0.206
Mildly Agree	4a	0.2091	0.635	0.0322	0.141
Mildly Agree	4b	0.1107	0.3339	0.0176	0.0767
Agree	5a	0.2815	0.3339	0.6269	0.6776
Agree	5b	0.1468	0.3032	0.3273	0.3411
Strongly Agree	6a	0.6003	0.0595	0.6027	0.5145
Strongly Agree	6b	0.3785	0.0595	0.3634	0.3133

Capacity	Sample 1	Sample 2
# of observations	44	20
Relative Frequency		
Completely Disagree	0.0455	0.0500
Relative Frequency		
Disagree	0.4091	0.2000
Relative Frequency		
Mildly Agree	0.3182	0.6000
Relative Frequency		
Agree	0.2045	0.1500
Relative Frequency		
Strongly Agree	0.0227	0.0000

Question: SD Collaborativeness, code=14, discretes=5

		Gender	Country	Capacity	Position
Pearson	1	0.3873	0.2442	0.9159	0.6357
Completely Disagree	2a	0.5023	0.8804	0.5023	0.2761
Completely Disagree	2b	0.2629	0.4235	0.2714	0.1482
Disagree	3a	0.2144	0.0471	0.9511	0.5732
Disagree	3b	0.1117	0.0375	0.4707	0.3058
Mildly Agree	4a	0.8906	0.2281	0.8903	0.5347
Mildly Agree	4b	0.4511	0.1196	0.4425	0.2711
Agree	5a	0.1629	0.6135	0.8326	0.6463
Agree	5b	0.089	0.3271	0.4184	0.314
Strongly Agree	6a				
Strongly Agree	6b				

Country	Sample 1	Sample 2
# of observations	9	55
Relative Frequency		
Completely Disagree	0.1111	0.0909
Relative Frequency		
Disagree	0.4444	0.1636
Relative Frequency		
Mildly Agree	0.2222	0.4364
Relative Frequency		
Agree	0.2222	0.3091
Relative Frequency		
Strongly Agree		

Question: SD EmotSDnality, code=18, discretes=5

		Gender	Country	Capacity	Position
Pearson	1	0.6877	0.0681	0.7165	0.8723
Completely Disagree	2a	0.9494	0.0291	0.3024	0.86
Completely Disagree	2b	0.512	0.028	0.1619	0.4428
Disagree	3a	0.6131	0.638	0.6918	0.9464
Disagree	3b	0.3126	0.3101	0.3459	0.4833
Mildly Agree	4a	0.2418	0.3737	0.8859	0.542
Mildly Agree	4b	0.1262	0.1886	0.4497	0.2809
Agree	5a	0.4616	0.175	0.5636	0.4637
Agree	5b	0.249	0.0739	0.2871	0.2412
Strongly Agree	6a				
Strongly Agree	6b				

Country	Sample 1	Sample 2
# of observations	9	54
Relative Frequency		
Completely Disagree	0.3333	0.0741
Relative Frequency		
Disagree	0.4444	0.3519
Relative Frequency		
Mildly Agree	0.2222	0.3889
Relative Frequency		
Agree	0.0000	0.1852
Relative Frequency		
Strongly Agree		

Question: SD Diversity, code=20, discretes=5

		Gender	Country	Capacity	Position
Pearson	1	0.4087	0.4542	0.0367	0.232
Completely Disagree	2a	0.5564	0.1375	0.4131	0.29
Completely Disagree	2b	0.3009	0.1323	0.225	0.1684
Disagree	3a	0.8357	0.885	0.0961	0.8333
Disagree	3b	0.4045	0.4206	0.0404	0.4447
Mildly Agree	4a	0.2274	0.3257	0.8903	0.6009
Mildly Agree	4b	0.1183	0.1734	0.4414	0.3016
Agree	5a	0.9943	0.9518	0.8381	0.9972
Agree	5b	0.5129	0.4609	0.4321	0.5016
Strongly Agree	6a	0.1103	0.7561	0.0151	0.0471
Strongly Agree	6b	0.0706	0.3494	0.0132	0.032

Capacity	Sample 1	Sample 2
# of observations	46	20
Relative Frequency		
Completely Disagree	0.0435	0
Relative Frequency		
Disagree	0.1304	0
Relative Frequency		
Mildly Agree	0.4783	0.5
Relative Frequency		
Agree	0.3261	0.3
Relative Frequency		
Strongly Agree	0.0217	0.2

Question: SD Environment, code=22, discretes=5

		Gender	Country	Capacity	Position
Pearson	1	0.4699	0.0249	0.3394	0.3713
Completely Disagree	2a	0.5917	0.0628	0.6003	0.5119
Completely Disagree	2b	0.3799	0.0628	0.364	0.3129
Disagree	3a	0.6694	0.3138	0.4945	0.5181
Disagree	3b	0.3525	0.1638	0.2586	0.2644
Mildly Agree	4a	0.5987	0.3037	1	0.4512
Mildly Agree	4b	0.3008	0.1556	0.5131	0.233
Agree	5a	0.7755	0.3159	0.2099	0.6769
Agree	5b	0.3761	0.1633	0.1162	0.3426
Strongly Agree	6a	0.4297	0.1437	0.4084	0.2951
Strongly Agree	6b	0.2564	0.1373	0.2214	0.2214

Country	Sample 1	Sample 2
# of observations	9	55
Relative Frequency		
Completely Disagree	0.1111	0
Relative Frequency		
Disagree	0.3333	0.1818
Relative Frequency		
Mildly Agree	0.3333	0.5273
Relative Frequency		
Agree	0.1111	0.2727
Relative Frequency		
Strongly Agree	0.1111	0.0182

Question: SD Curriculum, code=24, discretes=5

		Gender	Country	Capacity	Position
Pearson	1	0.5455	0.1601	0.3899	0.6656
Completely Disagree	2a	0.8669	0.0446	0.1812	0.6615
Completely Disagree	2b	0.5005	0.044	0.0964	0.3493
Disagree	3a	0.7333	0.7991	0.394	0.7226
Disagree	3b	0.3908	0.3778	0.1975	0.3618
Mildly Agree	4a	0.3051	0.6113	0.4912	0.3207
Mildly Agree	4b	0.1623	0.3115	0.2457	0.1612
Agree	5a	0.1437	0.4571	0.5049	0.3158
Agree	5b	0.0769	0.2381	0.2513	0.1632
Strongly Agree	6a				
Strongly Agree	6b				

Country	Sample 1	Sample 2
# of observations	9	56
Relative Frequency		
Completely Disagree	0.2222	0.0357
Relative Frequency		
Disagree	0.2222	0.1786
Relative Frequency		
Mildly Agree	0.3333	0.4286
Relative Frequency		
Agree	0.2222	0.3571
Relative Frequency		
Strongly Agree		

Table 5.4 MATLAB EXTRACT – SINGLE CAPABILITIES – ALL RESPONSES - DEVELOPMENT

Question: SD Outcomes, code=26, discretes=5

		Gender	Country	Capacity	Position
Pearson	1	0.0876	0.2156	0.0452	0.1144
Completely Disagree	2a	0.0998	0.1686	0.0898	0.2905
Completely Disagree	2b	0.0436	0.1142	0.0386	0.1605
Disagree	3a	0.3385	0.3711	0.0258	0.1242
Disagree	3b	0.1798	0.1869	0.0176	0.0681
Mildly Agree	4a	0.677	0.2512	0.2204	0.1486
Mildly Agree	4b	0.3472	0.1287	0.1098	0.0723
Agree	5a	0.2474	0.2717	0.6027	0.6618
Agree	5b	0.1289	0.1344	0.302	0.3315
Strongly Agree	6a	0.1713	0.6357	0.6001	0.2708
Strongly Agree	6b	0.1451	0.5034	0.3822	0.1779

Gender	Sample 1	Sample 2
# of observations	44	19
Relative Frequency		
Completely Disagree	0.1364	0
Relative Frequency		
Disagree	0.2727	0.1579
Relative Frequency		
Mildly Agree	0.3636	0.4211
Relative Frequency		
Agree	0.2273	0.3684
Relative Frequency		
Strongly Agree	0.0000	0.0526

Question: SD Change, code=28, discretes=5

		Gender	Country	Capacity	Position
Pearson	1	0.0311	0.5568	0.155	0.1728
Completely Disagree	2a	0.1239	0.6406	0.3674	0.1957
Completely Disagree	2b	0.0598	0.3403	0.1841	0.0925
Disagree	3a	0.0942	0.7071	0.8262	0.6075
Disagree	3b	0.0507	0.3716	0.4276	0.3108
Mildly Agree	4a	0.3402	0.903	0.5297	0.3295
Mildly Agree	4b	0.1711	0.4377	0.2719	0.1638
Agree	5a	0.5406	0.1328	0.5023	0.9233
Agree	5b	0.2957	0.1045	0.2688	0.4815
Strongly Agree	6a	0.0363	0.6293	0.0493	0.078
Strongly Agree	6b	0.0349	0.3812	0.0432	0.0598

Gender	Sample 1	Sample 2
# of observations	46	18
Relative Frequency		
Completely Disagree	0.2174	0.0556
Relative Frequency		
Disagree	0.3261	0.5556
Relative Frequency		
Mildly Agree	0.3478	0.2222
Relative Frequency		
Agree	0.1087	0.0556
Relative Frequency		
Strongly Agree	0.0000	0.1111

Question: SD Moral, code=30, discretes=5

		Gender	Country	Capacity	Position
Pearson	1	0.2156	0.8665	0.29	0.3999
Completely Disagree	2a	0.053	0.4369	0.055	0.1523
Completely Disagree	2b	0.0213	0.2238	0.0252	0.0759
Disagree	3a	0.7938	0.956	0.7593	0.6614
Disagree	3b	0.4048	0.4689	0.3847	0.3431
Mildly Agree	4a	0.1501	0.4931	0.3869	0.3462
Mildly Agree	4b	0.079	0.2524	0.1997	0.1822
Agree	5a	0.8409	0.9379	0.8339	0.4353
Agree	5b	0.4129	0.4596	0.4022	0.2382
Strongly Agree	6a				
Strongly Agree	6b				

Gender	Sample 1	Sample 2
# of observations	42	17
Relative Frequency		
Completely Disagree	0.1905	0
Relative Frequency		
Disagree	0.3333	0.2941
Relative Frequency		
Mildly Agree	0.3810	0.5882
Relative Frequency		
Agree	0.0952	0.1176
Relative Frequency		
Strongly Agree		

Table 5.5 MATLAB EXTRACT – SINGLE CAPABILITIES – ALL RESPONSES - DEVELOPMENT

Question: SD Culture, code=32, discretes=5

		Gender	Country	Capacity	Position
Pearson	1	0.4783	0.5151	0.5383	0.2289
Completely Disagree	2a	0.2608	0.2808	0.9566	0.9167
Completely Disagree	2b	0.1515	0.2034	0.4655	0.4949
Disagree	3a	0.6813	0.3561	0.2359	0.1567
Disagree	3b	0.3513	0.1767	0.1195	0.0818
Mildly Agree	4a	0.8436	0.4232	0.5735	0.8949
Mildly Agree	4b	0.4278	0.2079	0.283	0.4535
Agree	5a	0.2744	0.7404	0.3515	0.0736
Agree	5b	0.14	0.3966	0.1823	0.0378
Strongly Agree	6a	0.4046	0.6262	0.411	0.3009
Strongly Agree	6b	0.2339	0.3943	0.2223	0.1828

Position	Sample 1	Sample 2
# of observations	41	25
Relative Frequency		
Completely Disagree	0.0488	0.04
Relative Frequency		
Disagree	0.3659	0.2
Relative Frequency		
Mildly Agree	0.3415	0.36
Relative Frequency		
Agree	0.1951	0.4
Relative Frequency		
Strongly Agree	0.0488	0.0000

Question: SD Strategy, code=34, discretes=5

		Gender	Country	Capacity	Position
Pearson	1	0.3049	0.1771	0.9473	0.8969
Completely Disagree	2a	0.2123	0.1873	0.547	0.7693
Completely Disagree	2b	0.0988	0.0894	0.2984	0.3989
Disagree	3a	0.8883	0.2768	0.8179	0.5456
Disagree	3b	0.4563	0.1497	0.412	0.2695
Mildly Agree	4a	0.0909	0.2734	0.8123	0.9753
Mildly Agree	4b	0.0476	0.1465	0.4149	0.4838
Agree	5a	0.5191	0.1561	0.9787	0.6099
Agree	5b	0.2765	0.0737	0.5166	0.3077
Strongly Agree	6a				
Strongly Agree	6b				

Gender	Sample 1	Sample 2
# of observations	45	16
Relative Frequency		
Completely Disagree	0.2	0.0625
Relative Frequency		
Disagree	0.3333	0.3125
Relative Frequency		
Mildly Agree	0.2667	0.5
Relative Frequency		
Agree	0.2000	0.125
Relative Frequency		
Strongly Agree		

Table 5.6 MATLAB EXTRACT – GROUPED CAPABILITIES – SINGLE RESPONSES – IMPORTANCE

Question Group: IO Process mastery, codes=[21 23 25 27], discretes=5

		Gender	Country	Capacity	Position
Pearson	1	0.1546	0.5941	0.2238	0.367
Mostly unimportant	3a	0.2391	0.5469	0.8406	0.662
Mostly unimportant	3b	0.1147	0.2861	0.4912	0.3245
Moderately important	4a	0.6787	0.5177	0.2396	0.5322
Moderately important	4b	0.3589	0.29	0.1178	0.272
Important	5a	0.1157	0.3067	0.0627	0.1603
Important	5b	0.056	0.1514	0.0378	0.0801
Very Important	6a	0.0418	0.3992	0.2285	0.0748
Very Important	6b	0.0298	0.1952	0.1165	0.0368

Gender	Sample 1	Sample 2
# of observations	186	74
Relative Frequency		
of the Discrete 'Mostly Unimportant'	0.0215	0
Relative Frequency		
of the Discrete 'Moderetely Important'	0.0538	0.0405
Relative Frequency		
of the Discrete 'Important'	0.3441	0.2432
Relative Frequency		
of the Discrete 'Very Important'	0.5806	0.7162

Capacity	Sample 1	Sample 2
# of observations	182	78
Relative Frequency		
of the Discrete 'Mostly Unimportant'	0.0165	0.0128
Relative Frequency		
of the Discrete 'Moderetely Important'	0.0604	0.0256
Relative Frequency		
of the Discrete 'Important'	0.2802	0.3974
Relative Frequency		
of the Discrete 'Very Important'	0.6429	0.5641

Position	Sample 1	Sample 2
# of observations	162	98
Relative Frequency		
of the Discrete 'Mostly Unimportant'	0.0123	0.0204
Relative Frequency		
of the Discrete 'Moderetely Important'	0.0432	0.0612
Relative Frequency		
of the Discrete 'Important'	0.2840	0.3673
Relative Frequency		
of the Discrete 'Very Important'	0.6605	0.5510

Question Group: IO System mastery, codes=[29 31 33 35], discretes=5

		Gender	Country	Capacity	Position
Pearson	1	0.099	0.1816	0.0248	0.0324
Not at all important	2a	0.6006	0.6334	0.5985	0.2797
Not at all important	2b	0.3806	0.5074	0.3735	0.1894
Mostly unimportant	3a	0.2686	0.3445	0.0208	0.0224
Mostly unimportant	3b	0.1439	0.1833	0.0053	0.0161
Moderately important	4a	0.1616	0.115	0.3751	0.3666
Moderately important	4b	0.0792	0.0438	0.1896	0.1927
Important	5a	0.1296	0.1398	0.6459	0.4157
Important	5b	0.0647	0.0668	0.3197	0.2092
Very Important	6a	0.0643	0.7431	0.4262	0.2187
Very Important	6b	0.048	0.3616	0.2156	0.1091

Gender	Sample 1	Sample 2
# of observations	184	76
Relative Frequency		
of the Discrete 'Not at all important'	0.0054	0
Relative Frequency		
of the Discrete 'Mostly Unimportant'	0.0163	0.0395
Relative Frequency		
of the Discrete 'Moderetely Important'	0.0707	0.0263
Relative Frequency		
of the Discrete 'Important'	0.3750	0.2763
Relative Frequency		
of the Discrete 'Very Important'	0.5326	0.6579

Country	Sample 1	Sample 2
# of observations	35	225
Relative Frequency		
of the Discrete 'Not at all important'	0	0.0044
Relative Frequency		
of the Discrete 'Mostly Unimportant'	0	0.0267
Relative Frequency		
of the Discrete 'Moderetely Important'	0.0000	0.0667
Relative Frequency		
of the Discrete 'Important'	0.4571	0.3289
Relative Frequency		
of the Discrete 'Very Important'	0.5429	0.5733

Capacity	Sample 1	Sample 2
# of observations	181	79
Relative Frequency		
of the Discrete 'Not at all important'	0.0055	0
Relative Frequency		
of the Discrete 'Mostly Unimportant'	0.0055	0.0633
Relative Frequency		
of the Discrete 'Moderetely Important'	0.0663	0.0380
Relative Frequency		
of the Discrete 'Important'	0.3370	0.3671
Relative Frequency		
of the Discrete 'Very Important'	0.5856	0.5316

Position	Sample 1	Sample 2
# of observations	162	98
Relative Frequency		
of the Discrete 'Not at all important'	0	0.0102
Relative Frequency		
of the Discrete 'Mostly Unimportant'	0.0062	0.051
Relative Frequency		
of the Discrete 'Moderetely Important'	0.0679	0.0408
Relative Frequency		
of the Discrete 'Important'	0.3272	0.3776
Relative Frequency		
of the Discrete 'Very Important'	0.5988	0.5204

Table 5.7 MATLAB EXTRACT – GROUPED CAPABILITIES – GROUPED RESPONSES – IMPORTANCE

Question Group: IO Interpersonal mastery, codes=[13 15 17 19], discretes=3

		Gender	Country	Capacity	Position
Pearson	1	0.3709	0.2167	0.0448	0.21
Mostly unimportant	3a	0.5983	0.6296	0.1744	0.2756
Mostly unimportant	3b	0.3814	0.4942	0.1471	0.1884
Moderately important	4a	0.422	0.1823	0.1158	0.4732
Moderately important	4b	0.2198	0.0826	0.0495	0.2422
Important	5a	0.3298	0.162	0.2922	0.7516
Important	5b	0.1705	0.0716	0.1479	0.3859

Capacity	Sample 1	Sample 2
# of observations	180	80
Relative Frequency		
of the Discrete 'Mostly Unimportant'	0	0.0125
Relative Frequency		
of the Discrete 'Moderetely Important'	0.0556	0.0125
Relative Frequency		
of the Discrete 'Important'	0.9444	0.9750

Question Group: IO System mastery, codes=[29 31 33 35], discretes=3

		Gender	Country	Capacity	Position
Pearson	1	0.2919	0.1264	0.0338	0.0164
Mostly unimportant	3a	0.4314	0.2985	0.0156	0.0102
Mostly unimportant	3b	0.2271	0.1572	0.0156	0.009
Moderately important	4a	0.1643	0.1143	0.368	0.3658
Moderately important	4b	0.0787	0.0457	0.1943	0.1898
Important	5a	0.494	0.0513	0.5309	0.4377
Important	5b	0.2498	0.018	0.2673	0.2218

Country	Sample 1	Sample 2
# of observations	35	225
Relative Frequency		
of the Discrete 'Mostly Unimportant'	0	0.0311
Relative Frequency		
of the Discrete 'Moderetely Important'	0.0000	0.0667
Relative Frequency		
of the Discrete 'Important'	1.0000	0.9022

Capacity	Sample 1	Sample 2
# of observations	181	79
Relative Frequency		
of the Discrete 'Mostly Unimportant'	0.011	0.0633
Relative Frequency		
of the Discrete 'Moderetely Important'	0.0663	0.0380
Relative Frequency		
of the Discrete 'Important'	0.9227	0.8987

Position	Sample 1	Sample 2
# of observations	162	98
Relative Frequency		
of the Discrete 'Mostly Unimportant'	0.0062	0.0612
Relative Frequency		
of the Discrete 'Moderetely Important'	0.0679	0.0408
Relative Frequency		
of the Discrete 'Important'	0.9259	0.8980

Table 5.8 MATLAB EXTRACT – GROUPED CAPABILITIES – SINGLE RESPONSES – DEVELOPMENT

Question Group: SD Self mastery, codes=[6 8 10 12], discretes=5

		Gender	Country	Capacity	Position
Pearson	1	0.4898	0.1004	0.3815	0.3545
Completely Disagree	2a	0.8574	0.4123	0.4182	0.072
Completely Disagree	2b	0.4482	0.2263	0.2081	0.0427
Disagree	3a	0.4676	0.9111	0.2898	0.2621
Disagree	3b	0.2387	0.4711	0.1501	0.1279
Mildly Agree	4a	0.2059	0.1081	0.1012	0.5569
Mildly Agree	4b	0.101	0.0549	0.0552	0.2694
Agree	5a	0.9071	0.0652	0.2877	0.611
Agree	5b	0.4562	0.029	0.1434	0.3084
Strongly Agree	6a	0.1573	0.0879	0.6266	0.9758
Strongly Agree	6b	0.075	0.0812	0.3601	0.4662

Country	Sample 1	Sample 2
# of observations	36	223
Relative Frequency		
Completely Disagree	0.0278	0.0628
Relative Frequency		
Disagree	0.2778	0.2870
Relative Frequency		
Mildly Agree	0.5278	0.3857
Relative Frequency		
Agree	0.1111	0.2511
Relative Frequency		
Strongly Agree	0.0556	0.0135

Position	Sample 1	Sample 2
# of observations	160	99
Relative Frequency		
Completely Disagree	0.0373	0.0918
Relative Frequency		
Disagree	0.3106	0.2449
Relative Frequency		
Mildly Agree	0.3913	0.4286
Relative Frequency		
Agree	0.2422	0.2143
Relative Frequency		
Strongly Agree	0.0186	0.0204

Question Group: SD Interpersonal mastery, codes=[14 16 18 20], discretes=5

		Gender	Country	Capacity	Position
Pearson	1	0.582	0.0476	0.1053	0.3705
Completely Disagree	2a	0.7273	0.0174	0.1492	0.4288
Completely Disagree	2b	0.3811	0.0154	0.0753	0.2209
Disagree	3a	0.4921	0.1692	0.9899	0.9225
Disagree	3b	0.2524	0.0826	0.5019	0.4685
Mildly Agree	4a	0.6021	0.0879	0.8562	0.8936
Mildly Agree	4b	0.2992	0.0421	0.4281	0.4488
Agree	5a	0.893	0.227	0.9819	0.8568
Agree	5b	0.447	0.1114	0.4964	0.432
Strongly Agree	6a	0.126	0.7677	0.018	0.0557
Strongly Agree	6b	0.0848	0.3534	0.0164	0.0379

Country	Sample 1	Sample 2
# of observations	36	223
Relative Frequency		
Completely Disagree	0.1944	0.0717
Relative Frequency		
Disagree	0.3611	0.2511
Relative Frequency		
Mildly Agree	0.2778	0.4305
Relative Frequency		
Agree	0.1389	0.2287
Relative Frequency		
Strongly Agree	0.0278	0.0179

Capacity	Sample 1	Sample 2
# of observations	180	79
Relative Frequency		
Completely Disagree	0.1056	0.0506
Relative Frequency		
Disagree	0.2667	0.2658
Relative Frequency		
Mildly Agree	0.4056	0.4177
Relative Frequency		
Agree	0.2167	0.2152
Relative Frequency		
Strongly Agree	0.0056	0.0506

Position	Sample 1	Sample 2
# of observations	160	99
Relative Frequency		
Completely Disagree	0.1000	0.0707
Relative Frequency		
Disagree	0.2687	0.2626
Relative Frequency		
Mildly Agree	0.4125	0.4040
Relative Frequency		
Agree	0.2125	0.2222
Relative Frequency		
Strongly Agree	0.0063	0.0404

Question Group: SD Process mastery, codes=[22 24 26 28], discretes=5

		Gender	Country	Capacity	Position
Pearson	1	0.0745	0.3586	0.1366	0.2459
Completely Disagree	2a	0.0313	0.0585	0.0228	0.0586
Completely Disagree	2b	0.0125	0.0413	0.0088	0.0273
Disagree	3a	0.9561	0.9661	0.3152	0.8007
Disagree	3b	0.4782	0.4891	0.1598	0.4025
Mildly Agree	4a	0.6301	0.8669	0.5048	0.749
Mildly Agree	4b	0.3193	0.4356	0.2529	0.3798
Agree	5a	0.1569	0.281	0.2819	0.3055
Agree	5b	0.0814	0.1471	0.1409	0.1531
Strongly Agree	6a	0.1223	0.7615	0.6807	0.2922
Strongly Agree	6b	0.079	0.3563	0.3313	0.1548

Gender	Sample 1	Sample 2
# of observations	182	74
Relative Frequency		
Completely Disagree	0.1099	0.0270
Relative Frequency		
Disagree	0.2527	0.2568
Relative Frequency		
Mildly Agree	0.4121	0.3784
Relative Frequency		
Agree	0.2143	0.2973
Relative Frequency		
Strongly Agree	0.0110	0.0405

Country	Sample 1	Sample 2
# of observations	36	220
Relative Frequency		
Completely Disagree	0.1667	0.0727
Relative Frequency		
Disagree	0.2500	0.2545
Relative Frequency		
Mildly Agree	0.3889	0.4045
Relative Frequency		
Agree	0.1667	0.2500
Relative Frequency		
Strongly Agree	0.0278	0.0182

Capacity	Sample 1	Sample 2
# of observations	178	78
Relative Frequency		
Completely Disagree	0.1124	0.0256
Relative Frequency		
Disagree	0.2360	0.2949
Relative Frequency		
Mildly Agree	0.4157	0.3718
Relative Frequency		
Agree	0.2191	0.2821
Relative Frequency		
Strongly Agree	0.0169	0.0256

Question Group: SD System mastery, codes=[30 32 34 36], discretes=5

		Gender	Country	Capacity	Position
Pearson	1	0.1275	0.3403	0.1783	0.1187
Completely Disagree	2a	0.0679	0.585	0.1227	0.1375
Completely Disagree	2b	0.0315	0.2836	0.0582	0.0693
Disagree	3a	0.3979	0.1503	0.266	0.2032
Disagree	3b	0.2004	0.0773	0.1342	0.1001
Mildly Agree	4a	0.0452	0.6277	0.0977	0.1841
Mildly Agree	4b	0.0235	0.3153	0.0476	0.0931
Agree	5a	0.8309	0.1405	0.4605	0.1728
Agree	5b	0.4214	0.0672	0.2317	0.0862
Strongly Agree	6a	0.4272	0.6265	0.4103	0.3066
Strongly Agree	6b	0.2465	0.388	0.2265	0.1889

Gender	Sample 1	Sample 2
# of observations	181	71
Relative Frequency		
Completely Disagree	0.1381	0.0563
Relative Frequency		
Disagree	0.3370	0.2817
Relative Frequency		
Mildly Agree	0.3425	0.4789
Relative Frequency		
Agree	0.1713	0.1831
Relative Frequency		
Strongly Agree	0.0110	0.0000

Capacity	Sample 1	Sample 2
# of observations	178	74
Relative Frequency		
Completely Disagree	0.1348	0.0676
Relative Frequency		
Disagree	0.3427	0.2703
Relative Frequency		
Mildly Agree	0.3483	0.4595
Relative Frequency		
Agree	0.1629	0.2027
Relative Frequency		
Strongly Agree	0.0112	0.0000

Table 5.9 MATLAB EXTRACT – GROUPED CAPABILITIES – GROUPED RESPONSES – DEVELOPMENT

Question Group: SD Interpersonal mastery, codes=[14 16 18 20], discretes=3

		Gender	Country	Capacity	Position
Pearson	1	0.6912	0.0246	0.6271	0.7003
Disagree	3a	0.4018	0.006	0.3889	0.5703
Disagree	3b	0.201	0.0039	0.1949	0.2909
Mildly Agree	4a	0.5985	0.0821	0.8605	0.8981
Mildly Agree	4b	0.3025	0.0385	0.4283	0.4476
Agree	5a	0.7285	0.2985	0.4484	0.4215
Agree	5b	0.3603	0.1506	0.2235	0.2135

Country	Sample 1	Sample 2
# of observations	36	223
Relative Frequency		
Disagree	0.5556	0.3229
Relative Frequency		
Mildly Agree	0.2778	0.4305
Relative Frequency		
Agree	0.1667	0.2466

Question Group: SD Process mastery, codes=[22 24 26 28], discretes=3

		Gender	Country	Capacity	Position
Pearson	1	0.1653	0.5053	0.4796	0.3842
Disagree	3a	0.2312	0.2965	0.6646	0.3724
Disagree	3b	0.1169	0.1446	0.3286	0.191
Mildly Agree	4a	0.6269	0.8698	0.5091	0.7523
Mildly Agree	4b	0.3149	0.4417	0.2556	0.3783
Agree	5a	0.0663	0.3607	0.2252	0.1835
Agree	5b	0.0346	0.1803	0.1144	0.0936

Gender	Sample 1	Sample 2
# of observations	182	74
Relative Frequency		
Disagree	0.3626	0.2838
Relative Frequency		
Mildly Agree	0.4121	0.3784
Relative Frequency		
Agree	0.2253	0.3378

Appendix 6 MATLAB – Interpretation of Appendix 5 Data

MATLAB Results

The analysis of these results revealed which of the pairs of the demographics were statistically different and constituted factors for further research.

The results for 'Importance' and 'Development' were considered separately.

Singles – Importance of Factors

General Findings

All results show no difference in the answers by gender or country.

The factors which were of statistical interest where:

- Strategy – code 33
- Creativity – code 35

Strategy – code 33

The results are statistically significant and show that academics think that strategy is more important whereas administrators think that it is mostly unimportant. The results are consistent across both discrete values and the distributions are different showing that the effect is statistically valid.

Discrete 5

12% of administrators considered that strategy was mostly unimportant compared to 0% of academics.

The tests show that there were statistically different p values (< 0.04) for this result.

This results in different distributions between both populations with a p value of < 0.05 which shows that the result is valid.

Discrete 3

12% administrative staff considered that strategy was 'mostly unimportant' compared to 0% for academic staff.

Therefore, academics think that strategy was more important.

The discrete results and the distribution are different and therefore the finding is statistically valid.

Creativity – code 35

Discrete 5

Creativity is considered to be 'important' by both academics and administrators with a p value of <0.05.

100% of academics and 90% of professional staff think that creativity is important.

Discrete 3

10% of administrative staff considered creativity was ‘moderately important’ compared to 0% for academic staff with a borderline p value of 0.05.

However, 100% of academic staff considered creativity to be ‘important’.

Conclusions

This is a very valid effect because the distributions (p value) is different for both the 3 and the 5 discrete values. Both sets of discrete values are statistically different and the distributions are also statistically different.

The results are almost identical between the five discrete value results and the three discrete value results – which is lower than would normally be expected.

Singles – Development of Factors

General Findings

Results show differences for all demographic factors.

All factors were of statistical interest.

Singles – Development of Factors

Self-Development – code 6

Demographic - Country

Discrete 5

The results can be considered homogeneous apart from the demographic ‘country’ – which shows that South Africans were more concentrated around the ‘mildly agree’ response than the Australians who were more broadly spread although they also tended to also ‘mildly agree’.

Discrete 3

Australians had a slightly borderline statistical significance with 23% Australians agreeing that ‘Self-Development’ was developed as opposed to 0% of South Africans.

This result is not confirmed by the 5 discrete results therefore it cannot be considered a valid effect and requires further investigation.

Communication – code 8

Overall communication shows a homogeneous response across the demographics of ‘country’ and ‘position’.

Demographic – Gender

The results show that ‘men’ have a greater spread in their responses but with only a moderate difference in the responses for ‘mildly agree’.

Demographic – Capacity

Discrete 5 and Discrete 3

There is borderline statistical significance between the two samples with 22% of 'academics' agreeing that 'communication' was better developed as opposed to 5% of administrators.

This result is consistent between both sets of discrete variables.

Ethics – code 10

All results are homogeneous apart from gender.

Demographic – Gender

Discrete 5

Females agreed that ethics was better developed - 61% females versus 32% of males. This was a statistical significance (p value <0.03) and requires further investigation.

Discrete 3

Females agreed that ethics was better developed - 62% versus 36% of males.

Females demonstrated a greater spread of opinion – with borderline statistical significance for both discrete 3 and discrete 5 and requires further investigation.

Resilience – code 12

The results for all demographics were not of significance apart from capacity.

Demographic – Capacity

Discrete 5 and Discrete 3

In both discrete cases academics showed a more diverse range of opinions and were less likely (60% to 32%) than administrators to mildly agree that resilience was developed.

Collaborativeness – code 14

The results for all demographics were not of significance apart from country.

Discrete 5

South Africans disagreed that collaborativeness was well developed with a p value <0.05 (44% against 16% for Australians). This effect is diluted by the discrete 3 results.

Discrete 3

Again, South Africans disagreed that collaborativeness was well developed but this was of borderline statistical significance with 56% of South Africans versus 25% of Australians. This requires further investigation.

Empowerment – code 16

The results for all demographics were not of significance apart from gender.

Demographic – Gender

Discrete 5

Discrete 5 showed no statistically significant results.

Discrete 3

Males considered that empowerment was well developed - 13% against 0% females but this is a borderline result in the discrete 3 case.

Emotionality – code 18

The results for all demographics were not of significance apart from country.

Discrete 5

South Africans completely disagreed that emotionality was well developed with a p value <0.03 (33% against 7% of Australians).

Discrete 3

Again, South Africans disagreed that emotionality was well developed but this was of borderline statistical significance with 78% of South Africans versus 43% of Australians and requires further investigation.

Diversity – code 20

Homogeneous apart from capacity and position.

Demographic – Capacity

Strong statistical evidence that administrators think that diversity is better developed

Discrete 5

There is statistically strong evidence that administrators think that diversity is better developed 22% compared to 2% academics; whilst 13% of academics disagree that it is developed. These distributions are of borderline statistical significance.

Discrete 3

There is statistically strong evidence that 17% of academics disagreed that diversity was well developed however there is no statistically significant difference in opinion.

Demographic – Position

Discrete 5

Similarly 2.4% of academics versus 16% of professional staff strongly agree that diversity is supported and well developed.

Discrete 3

The discrete 5 effect is diluted to 34% of academics and 48% of professional staff and is not statistically significant.

Overall both demographics of capacity and position demonstrate that there is a statistically significant difference of opinion.

Environment – code 22

Some differences in distribution and were homogeneous apart from country.

Demographic – Country

Discrete 5

South Africans think that the environment is less developed as a whole compared to the Australians with a more variable distribution with 11% completely disagreeing compare to 0% but the results were not statistically significant.

Discrete 3

There was a borderline difference ($p < 0.051$) with 44% of South Africans disagreeing compared to 18% of Australians.

Curriculum – code 24

Homogeneous apart from country

Demographic - Country

Discrete 5

22% of South Africans consider that curriculum is less developed as compared to 4% of Australians which is statistically significant with a p value less than 0.05 on both discretes.

Discrete 3

The results were diluted with 44% of South Africans versus 21 %of Australians disagreeing about development. Apart from differences in distribution there were no statistically significant results.

There was no difference in distribution however the overall results from this question show that there is a statistically significant difference which will need more investigation.

Outcomes – code 26

The results were homogeneous apart from gender and capacity.

Demographic – Gender

Discrete 5

14% males completely disagreed that there was a focus on educational outcomes compare to 0% of females which is of borderline significance.

Discrete 3

There was borderline statistical significance that 41% of men disagreed that there was not an outcomes focus compare to 16% of females and more research is needed.

Demographic – Capacity

Overall there was no significant difference and an artificial effect is probable.

Discrete 5

14% academic completely disagreed that there was a focus on educational outcomes compare to 0% of administrators which is statistically significant.

Discrete 3

14% of academics completely disagreed and 16% of academics against 42% of professional staff disagreed with a statistically significant difference between the distributions.

Change – code 28

The results were homogeneous apart from gender and capacity.

Demographic – Gender

Discrete 5

11% females strongly agreed that there was a focus on change leadership compared to 0% of males with a statistically significant difference between the distributions. These results were diluted by the discrete 3 outcomes and were probably artificial.

Discrete 3

These results were not statistically significant with17% of women agreeing versus 11% of men.

Demographic – Capacity

Discrete 5

11% of administrators strongly agreed that there was a focus on change leadership compared to 0% of academics. These results were diluted by the discrete 3 outcomes and are probably not significant.

Discrete 3

These results were not statistically significant

Moral purpose – code 30

The results were homogeneous apart from gender and capacity.

Demographic – Gender

Discrete 5

19% males completely disagreed that there was a focus on moral purpose compared to 0% of females. This result was considered borderline.

Discrete 3

These results were not statistically significant as the relative results were 52% - males and 29% females – with more research needed.

Demographic – Capacity

Discrete 5

19% of academics completely disagreed that there was a focus on moral purpose compared to 0% of administrators which is of borderline statistical significance.

Discrete 3

These results were more diluted as they were 50% academics versus 35% administrators and were not statistically significant.

Learning Culture – code 32

The results were homogeneous apart from position.

Demographic – Position

Discrete 5

These results were of borderline statistical significance with 40 % of administrators versus 20% of academics agreeing that there was a learning culture was fostered by leadership

Discrete 3

These results were diluted as the relative results were 25% - academics versus 40% administrators.

Strategy – code 34

The results were homogeneous apart from gender.

Demographic – Gender

Discrete 5

Males had a borderline statistically significant outcome with a more diverse opinion but nothing of statistical significance.

Discrete 3

These results were of borderline statistical significance with 50% of the females mildly agreeing that the leadership acted strategically as opposed to 27% of males.

Creativity – code 36

The results were homogeneous apart from capacity and position.

Demographic – Capacity

Discrete 5

There were no statistically significant results.

Discrete 3

These results were of borderline statistical significance with 52% of academics disagreeing that leadership fostered creativity as opposed to 30% of administrators.

The discrete 3 results were diluted by the discrete 5 results but they are worth further investigation because their results mirror the outcomes for the demographic – Position.

Demographic – position

Discrete 5

There were no significant results

Discrete 3

These results were of borderline statistical significance with 54% of academics disagreeing that leadership fostered creativity as opposed to 32% of administrators – reflecting a similar result as the demographic capacity.

Importance of Factors by Group

The groups of Interpersonal, Process and Systems mastery produced results of statistical interest.

Self-mastery - codes= [5,7,9,11]

No results of statistical significance

Interpersonal mastery - codes= [13 15 17 19]

Country and position were homogeneous.

Demographic – Gender

Discrete 5

61% of males think that this is very important significant versus 76% of females which is of statistical significance but this result is reversed by the fact that 34% of males and 21% of females think that is important – thus reversing the very important finding.

Males had a more diverse opinion but nothing of statistical significance.

Discrete 3

The discrete 3 results completely dilute the discrete 5 findings with 99.5% male vs 100% females finding self-mastery to be moderately important/important.

Demographic – Capacity

Discrete 5

No results of statistical significance

Discrete 3

No results of statistical significance

Process mastery - codes= [21,23,25,27]

Country was homogeneous.

Demographic – Gender

Discrete 5

Evidence to suggest that females considered process mastery to be very important (72% versus 58% males).

This is a statistically important result.

Discrete 3

The differences between the genders is very diluted – 96% versus 92% - so this is probably not statistically significant.

Demographic – Capacity

These results are of borderline statistical significance.

Discrete 5

Administrators consider process mastery to be important – 40% versus 28% for academics.

Discrete 3

This effect is completely diluted and is no longer of statistical significance being 96% versus 92%.

Demographic – Position

The results for position are very similar to those of capacity

Discrete 5

55% of administrators compared to 66% of academics consider that process mastery is very important. This is of borderline statistical significance.

Discrete 3

This effect is even more diluted with 92% of administrators against 94% of academics considering that process mastery is important but the result is probably insignificant.

System mastery - codes= [29,31,33,35]

All demographics yielded results of interest.

Demographic – Gender

Discrete 5

66% of females considered systems mastery to be very important compared to 53% of males which is of borderline statistical significance.

Discrete 3

This result became more diluted with 93% of females versus 91% males considering this to be very important – so this result is not significant as a whole.

Demographic – Country

Discrete 5

Australians have a great variance in opinion but this is a borderline result.

Discrete 3

This is a borderline result with 100% of South Africans considering systems mastery to be important compared to 90% of Australians which is worth further investigation.

Demographic – Capacity

Discrete 5

6% of administrators consider systems mastery to be mostly unimportant compared to 0.5% of academics. This is a statistically significant difference with different distributions.

Discrete 3

The discrete 5 results are contradicted by the fact that 6% of administrators consider that systems mastery is mostly unimportant compared to 1% of academics. This is confirmed by the difference in distributions. Overall the results need further investigation.

Demographic – Position

This result is almost the same as the results for capacity

Discrete 5

5% of administrators consider systems mastery to be mostly unimportant compared to 0.6% of academics. This is confirmed as statistically significant difference with different distributions.

Discrete 3

The discrete 5 results are supported by the fact that 6% of administrators consider that systems mastery is mostly unimportant compared to 0.6% of academics. This is confirmed by the difference in distributions. This is a proven effect - academics think that this is a less important factor .

Groups – Development of Factors

Self-mastery - codes= [5,7,9,11]

Overall the results were very homogeneous, but two demographics were of borderline statistical significance and non-homogeneous.

Demographic – Country

Discrete 5

South Africans – 11% agreed that self-mastery was well developed as opposed to 25% of Australians.

This result was of borderline statistical significance.

Discrete 3

The discrete 5 difference was diluted to 17% of South Africans and 26% of Australians and was not of statistical significance.

Demographic – Position

Discrete 5

4% of academics completely disagreed that self-mastery was well developed as opposed to 9% of administrators. This result was borderline.

Discrete 3

The discrete 5 position was diluted and reversed with 35% of academics disagreeing and 34% of administrators disagreeing – which shows that this is not of statistical significane.

Interpersonal mastery - codes= [13 15 17 19]

The results for gender were homogeneous however the results for country, capacity and position were not.

Both distributions were different with South Africans having a wider but borderline spread. This was a statistically significant result.

Demographic – Country

Both discretes show a consistent difference so this is a proven result.

Discrete 5

7% of Australians completely disagreed that interpersonal mastery was well developed as opposed to 19% of South Africans.

Discrete 3

The discrete 5 results was confirmed with 32% of Australians disagreeing that interpersonal mastery was well developed as opposed to 56% of South Africans.

Demographic – Capacity

Discrete 5

5% of administrators strongly agreed that interpersonal mastery was well developed as opposed to 0.6% of academics. This result was statistically proven.

Discrete 3

The result was diluted with 27% of administrators and 22% of academics agreeing that interpersonal mastery was well developed.

This result is probably artificial.

Demographic – Position

The results were almost homogeneous but there were some borderline statistically significant findings.

Discrete 5

4% of administrators and only 0.6% of academics strongly agreed that interpersonal mastery was well developed. This result is of borderline statistical significance.

Discrete 3

The discrete 5 result was diluted with 26% of administrators and 22% of academics agreeing that interpersonal mastery was well developed – so there is no statistical significance.

Process mastery - codes= [21,23,25,27]

Demographic – Gender

Discrete 5

11% of males and 3% of females completely disagreed that process mastery was well developed – which is a statistically proven difference.

Discrete 3

The results were diluted to 36% of males and 28% of females disagreeing that process mastery was well developed which had no statistical difference. There was borderline statistical difference in the results for agreement with 22% of males and 34% of females agreeing that process mastery was well developed. However both results are worth investigating further.

Demographic – Country

Discrete 5

There is borderline statistical significance in the result for completely disagree showing 17% of South Africans and 7% of Australians.

Discrete 3

The results showed 42% of South Africans disagreed as opposed to 33% of Australians – which is of no statistical significance but maybe worth investigating further.

Demographic – Capacity

Discrete 5

3% of administrators and 11% of academics completely disagreed that process mastery was well developed - which is statistically proven.

Discrete 3

The discrete 5 results were completely diluted to 32% of administrators and 35% of academics disagreeing.

Demographic – Position

These results reflect those of capacity and are of borderline statistical significance.

Discrete 5

4% of administrators and 11% of academics completely disagreed that process mastery was well developed. These results are borderline.

Discrete 3

The discrete 5 results are diluted as 31% of administrators and 36% of academics disagreed that process mastery was well developed.

Overall these results may be worth investigating further as academics consider this factor to be less developed.

System mastery - codes= [29,31,33,35]

Demographic – Gender

The results show that there was less variance in the responses from females.

Discrete 5

More males (14% versus 6% females) completely disagreed that systems mastery was well developed –which is of borderline statistical significance.

Discrete 3

The results are more diluted with 48% males against 34% females disagreeing that systems mastery was well developed which is worth investigating further.

Demographic – Capacity

Academics produced a wider spread of results but these are of borderline statistical significance. Otherwise there is no difference between the demographics for country, capacity and position which is a very homogeneous set of results.

Appendix 7 MATLAB – Example of raw output

```
Number of Pseudo-Validities: 10000


Question's Code: 5

Question's Descretes: five
The 'No opinion' answers are disregarded

Question's Long Name:
How developed in the University is Communication(importance)?

Question's Short Name:
How developed in the University is IO Self-development?

Question's Explanation:
Identifies personal strengths and weakness and takes responsibility for developing required
knowledge, skills and personal attributes (personal behaviours, preferences and styles). This
includes being confident to actively pursue and engage in professional development.


Question: IO Self-development, code=5, discretes=5
          Comparison by Gender


DESCRIPTION OF SAMPLE 1
IO Self-development
Limitations- (Gender: male) and (IO Self-development: (Not at all Important or Mostly
Unimportant or Moderately Important or Important or Very Important))

DESCRIPTION OF SAMPLE 2
IO Self-development
Limitations- (Gender: female) and (IO Self-development: (Not at all Important or Mostly
Unimportant or Moderately Important or Important or Very Important))

NUMERICAL CHARACTERISTICS OF THE SAMPLES
_____________________________________________________
|                                      |Sample 1|Sample 2|
|______________________________________|________|________|
|          # of observations           |   47   |   19   |
|          Relative Frequency          | 0.0851 | 0.0000 |
|of the Discrete 'Moderately Important'|        |        |
|          Relative Frequency          | 0.9149 | 1.0000 |
|     of the Discrete 'Important'      |        |        |
|______________________________________|________|________|


Tests for Equality of the Populations' Discrete Distributions

Pearson's statistic from the sample contingency table: 1.721
H0- the distributions of the populations are the same
H1- the distributions of the populations are different
bootstrap with 'equal-size generation' using ECDF
0.2167

Tests for Equality of the Populations' Relative Frequencies of Discrete 'Moderately Important'

difference of sample relative frequencies for discrete 'Moderately Important' : 0.08511
H0- the probabilities for discrete 'Moderately Important' are the same in the populations
H1- the probabilities for discrete 'Moderately Important' are the different in the populations
bootstrap with 'equal-size generation' using ECDF
0.193

difference of sample relative frequencies for discrete 'Moderately Important' : 0.08511
H0- the probabilities for discrete 'Moderately Important' are the same in the populations
H1- the probability for discrete 'Moderately Important' is greater in Population 1
bootstrap with 'equal-size generation' using ECDF
0.1014
```

```
Tests for Equality of the Populations' Relative Frequencies of Discrete 'Important'

difference of sample relative frequencies for discrete 'Important' : -0.08511
H0- the probabilities for discrete 'Important' are the same in the populations
H1- the probabilities for discrete 'Important' are the different in the populations
bootstrap with 'equal-size generation' using ECDF
0.193

difference of sample relative frequencies for discrete 'Important': -0.08511
H0- the probabilities for discrete 'Important' are the same in the populations
H1- the probability for discrete 'Important' is greater in Population 2
bootstrap with 'equal-size generation' using ECDF
0.1014
```